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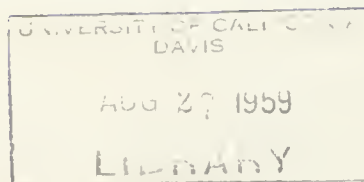
FEATHER RIVER AND DELTA
DIVERSION PROJECTS

BULLETIN NO. 78

INVESTIGATION OF
ALTERNATIVE AQUEDUCT SYSTEMS
TO SERVE SOUTHERN CALIFORNIA

APPENDIX A

LONG RANGE ECONOMIC POTENTIAL OF
THE ANTELOPE VALLEY-MOJAVE RIVER BASIN



EDMUND. G. BROWN
Governor



HARVEY O. BANKS
Director

JANUARY, 1959

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

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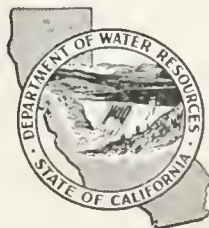
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INTRODUCTORY STATEMENT

The Department of Water Resources carried out the investigation of alternative aqueduct systems to serve southern California pursuant to appropriations of funds by legislative sessions of 1956, 1957, and 1958. The enclosed report is published as an appendix to Bulletin No. 78, the engineering report on the investigation prepared pursuant to the legislative direction. The conduct of the investigation included projections of the growth of economic demand for imported water in the Southern California Area. Basic to such projections were studies of economic development in the various component parts of the investigational area.

The Antelope Valley-Mojave River region constitutes a major undeveloped land resource within reasonable proximity to the Los Angeles Metropolitan Area. It has been the scene of an extensive land boom and has experienced substantial population growth in recent years. Because its future economic growth was generally recognized to be of a controversial nature, it was deemed desirable to have an outside agency make an economic study in the area that would aid the Department in preparing projections of growth of economic water demands.

The enclosed report was prepared for the Department of Water Resources by the firm of Booz, Allen and Hamilton, Management Consultants, under Standard Agreement 57-SA-109 dated April 1, 1957, reproduced at the end of this appendix as Attachment No. 1.

Long-Range Economic Potential
of the Antelope Valley-Mojave River Basin

Submitted to the
DEPARTMENT OF WATER RESOURCES
State of California
Sacramento, California

December 2, 1957

BOOZ · ALLEN & HAMILTON

Management Consultants

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PHILADELPHIA WASHINGTON DETROIT
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MADISON 7-3215

December 2, 1957

Mr. Harvey O. Banks, Director
Department of Water Resources
State of California
Sacramento, California

Dear Mr. Banks:

Pursuant to the terms of the contract dated April 1, 1957, executed between the Department of Water Resources of the State of California and Booz, Allen & Hamilton, there is submitted herewith the final report covering our economic survey of the Antelope Valley-Mojave River area situated in Los Angeles, San Bernardino, and Kern Counties.

1. SCOPE AND PURPOSE OF THE SURVEY

This survey had its origin in the formulation and consideration of plans by the state with respect to the fulfillment of the Feather River Project. The purpose of the survey has been to provide a factual analysis of the economic aspects of the Antelope-Mojave basin incident to the making of decisions by appropriate state government authorities as to alternative aqueduct routes and potential water service areas under this major water import program.

Our report in no way submits recommendations concerning the different routes and areas under consideration; nor does it in any way attempt to evaluate the comparative feasibility and advisability of stimulating the growth of particular and less highly developed areas of Southern California by interbasin water diversions. Such basic policy decisions are the prerogative and obligation of the state which must necessarily take into account many factors beyond those encompassed in our survey.

The accompanying report is directed exclusively to the present and long-range economic potential of the Antelope-Mojave basin. This area of emerging economic significance covers approximately 7,600 square miles of territory, largely semiarid in character. It is located directly north of Los Angeles and San Bernardino and is separated from the metropolitan center by the San Gabriel and San Bernardino Mountains. (See Map A, following this page, showing geographic setting of the subject area in relation to the state.)

The scope of the report covers the economic relationship of the Antelope-Mojave area to the general south coastal region and its present characteristics as a foundation for future growth estimates. The report then presents an evaluation of the area's economic potential in terms of agricultural, industrial, commercial, and military development; quantitative estimates of population growth; the character of probable land use; and estimated payment capacity for Feather River water.

2. PREMISES AND ASSUMPTIONS

In projecting economic and population trends over the next 60 years, which enters a period beyond the range of definitive prediction, it is necessary to make certain basic assumptions as to general world and national conditions over the indicated span of time. The following have accordingly been employed as fundamental premises in our forecast of future trends.

- (1) No Major International Conflict Will Arise during This Period To Disrupt the World Political or Economic Balance or To Impair Steady National Economic Growth

In an uncertain world, it must be recognized that anything may happen and that any international conflict would have immediate repercussions on the economic life of the investigational area. For purposes of our survey projections, however, we must assume a continuation of general international conditions in present-day terms.

- (2) Present Favorable National Economic Trends Will Continue at Full Employment Levels

It is a fair assumption that the nation as a whole is more depression-proof than in the pre-World-War II period and that the country can look forward with confidence to an expanding economy. While there may be moderate fluctuations during periods of lower or higher productivity, we assume that the economy long range will continue indefinitely to reflect an approximate 3% annual growth rate.

(3) Present-Day Price Levels Will Be Applied for Projection Purposes

Price levels are steadily if slowly advancing perhaps as a concomitant of economic expansion. Since we cannot predict this movement with any certainty and since in any case it is assumed that price relationships will remain relatively stable, we have used current price levels in all projections.

In addition to these underlying assumptions, it has also been necessary to make certain precise assumptions as to the course and progress of the Feather River Project itself in order to provide some firm benchmarks for the current study.

(4) Authoritative Decisions as to Alternate Routes and Water Service Areas Will Be Reached and Announced Publicly by 1960

Whether or not decisions are made and the affected areas advised as to approved aqueduct routes and service districts well in advance of water delivery dates has an important bearing on early growth rates. Continued uncertainty as to the future availability of Feather River water in particular areas will dampen growth trends. We have assumed that these issues will be clarified at an early date, thereby giving an adequate planning and adjustment period before imported water is delivered.

- (5) Feather River Water Will Be Delivered to the Antelope-Mojave Area by 1970 with Adequate Supply Available Thereafter for All Purposes

This date has been fixed by the Department of Water Resources strictly for purposes of our study without prejudice to other considerations or final plans. Its significance lies in the fact that growth in the area must be premised on utilization of existing water resources until 1970. We have assumed that water availability will not be a limiting factor to population and economic growth after 1970.

- (6) Assumed Prices for Imported Water Delivered at Point of Use Will Be as Follows in Dollars per Acre-Foot

	<u>Agricultural Use</u>	<u>Municipal and Industrial Use</u>
Minimum	\$25	\$ 50
Maximum	50	100

These price ranges were prepared by the Department of Water Resources solely for purposes of the survey as a basis for determining the effect of price policy for Feather River water upon the probable magnitude of water demand in the Antelope-Mojave basin. The ranges merely reflect possible upper and lower values. It is understood that actual price ultimately to be set is a policy matter not yet determined by state authorities (See Appendix A for official letter from the Department stating assumed prices.)

3. SURVEY METHODOLOGY

The area under study forms an outlying and economically under-developed part of three separate counties. Its relative unimportance in political and economic terms until very recent years together with the fact that it overlaps several political jurisdictions has tended to obscure its treatment as a natural and unified economic unit. As a result of these circumstances reliable statistics and economic indicators are generally nonexistent or subsumed into total county data not subject to segregation. This has constituted a major handicap in gaining a factual picture of the current situation.

Accordingly, in conducting our survey we have in many cases found it necessary to construct statistical measurements of present characteristics from fragmentary information supplied by numerous agencies, supplemented by our own observation and judgment. The resulting statistics cannot therefore be considered as possessing the degree of accuracy or comprehensiveness which applies to more highly developed political and economic units. Nevertheless, the derived estimates presented herein have, we believe, a reliability sufficiently adequate to provide a rounded and reasonable evaluation of the current status of area development.

In the survey process we have interviewed or consulted almost 200 individuals representing a wide range of public and private agencies. This was done both for purposes of acquiring factual information and for obtaining

informed opinions as to future growth trends. Such consultation has included federal, state, county, and local agencies; business organizations; civic groups; and others, both in the investigational area and in the affected county centers including Los Angeles. Counsel and advice was also obtained from several nationally acknowledged experts in the fields of population and economic trends. Likewise extensive and high-level conferences were held in Washington, D. C., with federal officials, on defense, budget, population, and economic aspects pertinent to the survey. A comprehensive list of individuals consulted is included in Appendix B.

A large volume of official records and published reports which bear on the Antelope-Mojave area was also studied. Finally, in order to obtain a firsthand understanding of the social and economic characteristics of the area, a systematic field survey was undertaken. This covered all established communities, some 15 in number; most of the major business establishments, all military installations, and selected farm areas.

In passing it may be mentioned that the survey was conducted during the months of May through August 1957, and reflects conditions prevailing and data available as of that time.

4. APPROACH AND BASIC CONSIDERATIONS

We are constrained to comment on the necessarily hazardous nature of forecasting over such a long period of time for such a relatively isolated

area which is still in the infancy of its growth. To select the proper aqueduct route from an economic standpoint it is necessary that the state estimate with reasonable accuracy the magnitude of future water demands far into the future. Unavoidably this requires very long-range planning. In this case the Department of Water Resources requested that our projections of economic and population growth extend to the year 2020 A.D. This moves into a period of time which must be admitted as being beyond our present comprehension. Technological developments not yet on the drawing boards may well render obsolete many of our current concepts, wants, and living modes

In making long-range forecasts we are necessarily conditioned by our present knowledge and perspective. To break through the veil of the future we have strained to obtain as accurate and as complete a picture of the investigational area as was possible within the limits of data availability already referred to. Obviously the more firm the present base of information the more reliable the forecasts premised thereon.

Nevertheless, projections over such a long period based merely on the firm actualities of the present or on foreseeable local trends in the immediate future may well prove to be misleading. Tying long-range estimates too closely to immediate and localized forces tends either to magnify or minimize certain growth elements which may in fact prove transitory over the long sweep.

Likely to be much more significant over a 60-year period of forecasting are those transcendent national, regional, and state trends which will exert an overriding effect on purely local influences. International developments, national economic growth patterns, advancing technology in industry and agriculture, and broad population pressures will more powerfully influence the future development of the Antelope-Mojave basin than its own encouraging beginnings. Therefore, in terms of broad methodological approach, without in any way minimizing present forces and trends as an indication of growth, we have tended to place more weight on national, regional, and state factors as a context for local area development.

But it must be stated candidly that estimates so far in the future, no matter how carefully formulated, cannot purport to be definitive. We are dealing herein with an assessment of relative possibilities - not absolutes. In the last analysis, we have had to rely on our best information and best judgment in looking forward from the perspective of the present and in gauging the imponderables and variables of the future.

5. GENERAL OUTLOOK FOR THE BASIN'S IMMEDIATE FUTURE

Some districts of the Antelope-Mojave basin area, notably Palm-dale and Lancaster, have witnessed a remarkable growth in the postwar period. The rate of growth has been accelerated during the recent past under the stimulus of national defense activities and the establishment of

defense-related industry. However, as yet, no large-scale volume of urban dispersal into this area has occurred because land is still available for urban expansion within the coastal basin closer to the Los Angeles metropolitan center. As this land becomes developed over the next few decades the vast expanse available in the Antelope-Mojave area will become of increasing importance to the pattern and dimensions of Los Angeles growth.

The crucial factor which will condition the growth of the subject area in the future is the availability of a reliable and adequate supply of water at economic prices. Without massive water imports the area will look forward to a doubtful future in which its potential remains largely undeveloped. With an assured and adequate supply of water, however, such as our study has assumed with Feather River deliveries by 1970, it is our conclusion that the Antelope-Mojave basin can anticipate in long-range terms an economic and population growth of tremendous proportions under the impetus of expansive pressures centering in the Los Angeles metropolitan complex.

In the 5 or 10 years immediately ahead, however, it is unlikely that the extraordinary growth rates which have multiplied population figures in recent years for some of the fast-growing Antelope Valley communities will be maintained. We expect that the area under study generally will continue to move ahead, with considerable increases in

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numerical population. However, this will probably occur at a somewhat lesser rate of growth (in relation to earlier years) during this interim period before Feather River water becomes available in 1970, as assumed

It is recognized that the authoritative announcement within the next two or three years by the state of aqueduct and water service plans which promise to bring Feather River water to the Antelope-Mojave area would in itself serve as a powerful stimulant to development plans and measures in anticipation of long-range potential. Nevertheless, looking forward to the next few years there are certain factors which may tend to moderate the almost phenomenal growth rate of the recent past applying particularly to some of the burgeoning communities of the Antelope Valley district - at least until other external forces come into play. Some of these factors which will somewhat limit immediate growth trends are:

- (1) Uninhibited land speculation, which has elevated raw and unimproved land prices beyond rates which will bring in economic returns over the short run, may tend temporarily to discourage new enterprise.
- (2) There is uncertainty as to the adequacy of underground water resources to support a major population and industrial growth pending imported water.
- (3) National defense expenditures which have to a considerable degree stimulated the rapid economic growth of recent years, are beginning to level off. Some of the operational military installations in the subject area may be expected to decline with the passing years as the shift to nuclear missiles accelerates.

- (4) The movement of industry toward the desert area, while we believe of great future promise, is not of a sufficiently strong trend at the present time or projected in the immediate future, to support an urban growth rate as high as that which has prevailed in the immediate past.
- (5) Congestion and land use saturation in the coastal area have not been and will not for some years to come be of sufficient magnitude to motivate wholesale urban settlement in the desert region.

6. LONG-RANGE POPULATION AND INDUSTRIAL PROSPECTS

In spite of this somewhat restrained outlook for the next several years, the long-range situation is highly favorable to support an expansion of striking magnitude in the Antelope-Mojave area under conditions of an assured water supply. Our survey indicates, however, that the period of great development and growth will occur only when forces which find their origin in superior national, state, and regional trends and influences begin to operate with direct impact on the subject area. This refers to the tremendous growth in national income and population forecast for the entire nation by the year 2020 A. D., consistent with the basic assumptions cited earlier.

As discussed in the text of the report, authoritative government sources unofficially estimate growth patterns which will achieve a gross national product for the nation rising from current levels of about \$434 billion annually to a prodigious total in the range of \$2,500 to \$3,000 billion by 2020 A. D. Likewise it is estimated that the population of the

United States will rise from 171 million in 1957 to a staggering figure in excess of 400 million by the year 2020 even with a tapering off growth rate projected after 1980.

These national growth trends are of enormous import to California. There is every reason to expect that westward migration will continue for many decades until there is greater balance between East and West. Among western states all signs indicate that California will continue to attract a heavy regional migration.

From the above national estimate and based on these considerations, we have calculated that the population of the State of California will increase from 14 million at present to approximately 50 million over the 60 years covered by the survey. Of this state total, we estimate that over 23 million will reside in the four counties of Los Angeles, Orange, Riverside, and San Bernardino which serve as the central generating source of population movements in the region.

That the Antelope-Mojave basin will be directly affected by these expansive pressures and the general trend toward dispersal to the fringes of metropolitan areas is, we believe, irrefutable. Major urban expansion can be expected to take place after 1980 when the Los Angeles coastal plain will have reached a considerably greater urban density. This metropolitan growth will push inexorably and with progressive intensity into adjacent areas where land and conditions for economic development are favorable.

The physical location and environment of the Antelope-Mojave basin and its economic potential constitute, in our view, favorable conditions to sharing in this great regional growth trend. The most important of these advantageous conditions applying to the basin are:

- (1) Possession of the largest single reservoir of relatively level land in California outside the Central Valley suitable for urban development. This land is at a comparatively lower cost and can accept any spill-over from the congested metropolitan area.
- (2) Proximity to the Los Angeles area with improved accessibility anticipated under planned additional transportation facilities.
- (3) A high altitude climate comparatively free of smog conditions.
- (4) A variety of minerals and deposits which can support a diversity of resource-based industries.
- (5) A physical environment and geographic setting favorable to the growth of aircraft and related industries as well as being suitable to the attraction of a varied complexity of basic industrial activity.
- (6) The existence of permanent military installations of a research and development character peculiarly suited to the desert area which are adaptable to use in missiles development, which are not likely to be seriously affected by adjustments in the national defense budget, and which form a stabilized base for the local economy.

It is the combination of these factors which leads us to the view that the Antelope-Mojave basin with adequate water will become a major satellite community of Los Angeles and will experience what may be considered as a dramatic growth pattern in the next half century. Taking into account national and state population trends and the forces which will serve to effect population movement for the general region, including

consideration of alternative sites available for urban development, we estimate that the population of the basin, from its present level of about 131,000 will reach approximately 344,000 by 1970. This will then surge to 1,956,000 by the year 2000 and, even with a leveled-off growth rate, rise to a population somewhere in the magnitude of 3,600,000 by the year 2020.

This estimate cannot be considered as fixed and absolute since clearly it is based on assumptions which may be eroded by the passage of time. It simply represents our best judgment based on probabilities as measured by a careful evaluation of all factors and forces impinging on the subject. Under the most favorable conditions population growth could prove to be higher by as much as 10% to 15%. Likewise it is conceivable that the variables and uncertainties of the future could produce an actual population lower than the estimate by an equal amount. For purposes of state planning at this time, however, we believe that the projected ultimate population of 3.6 million is a reasonable and feasible figure under the assumptions stated.

In this connection it should be emphasized once again that this estimate is premised on the assumed delivery of imported water in 1970. Should for any reason the announcement of intent or actual deliveries of such waters be delayed for 5 or 10 years beyond the assumed dates, then the population growth estimates would have to be adjusted accordingly.

While some growth would perhaps continue in ultimate anticipation of adequate water, generally it may be expected that the growth rate would be retarded almost proportional to the delay in announcement or deliveries.

Although outside the scope of our study, it is appropriate to comment that many other areas in Southern California will likewise experience dramatic growth rates over the next 60 years. We have not attempted to quantify these estimates. But it is clear from our study of the expansive forces building up in the entire coastal area that San Diego and Ventura Counties will also share in the tremendous population upsurge that is forecast for the four counties comprising the Los Angeles metropolitan complex.

7. THE FUTURE FOR AGRICULTURE

While urban and industrial growth will move apace it is our conclusion that agriculture has little if any important future in the area based on the assumed water prices of \$25 to \$50 per acre-foot. Farm production is probably now at its peak, with a progressively reduced acreage devoted to irrigated agriculture being forecast in the years ahead. Basic causes for this trend are comparatively high water costs, a limiting physical environment, and a limited cropping pattern, all of which produce low profitability. Also of increasing importance is the factor of urban encroachment which is creating land values that encourage subdivision.

Our study indicates that none of the field crops, fruits, or vegetables which are adaptable to this basin can be economically produced at

the maximum assumed price of \$50 per acre-foot for Feather River water. With \$25 water only vegetable production is feasible. However, the marginal character of the area in terms of competitive agricultural position precludes extensive development of a vegetable industry. Livestock in the area will tend to decrease though dairying is likely to increase commensurate with population growth. There is also likely to be a substantial poultry industry. Neither dairying nor poultry, however, will have an appreciable effect on water demand.

Although our adverse conclusions as to the general future of agriculture in the area are based on general incapacity to pay the assumed costs of imported water, it should be recognized that this conclusion could be somewhat altered by the policy ultimately adopted by the state or local districts concerning the extraction of ground water for irrigation purposes. Thus, conceivably, the ground-water supply could be reserved for agriculture, permitting such users to benefit from the recharge occasioned by the heavy use of imported water for municipal and industrial purposes. Assuming that such recharge would maintain the ground-water table at levels existing in 1970, many farm producers could probably continue in profitable operation with water costs less than the assumed import rates. This circumstance could somewhat offset unfavorable conditions applying to the agricultural situation and could lead to a larger acreage devoted to this purpose than projected in our report. In any case, the total magnitudes involved would still be small and would have little significant effect on total water demand.

We have not made the above assumption as to water policy, however, in evaluating the future of agriculture in the subject area. Our projections have been restricted to conditions under which all farm producers would pay the full \$25 to \$50 costs per acre-foot of imported water. Even with the minimum price of \$25 water, irrigated acreage is expected to decline from the present high of 104,000 to 10,800 by 1980 and remain nominal thereafter.

8. IMPLICATIONS FOR FUTURE WATER REQUIREMENTS

Even discounting the agricultural sector, economic and population growth of the potential magnitude forecast by this study for the Antelope-Mojave basin could give rise to a prospective level of water requirements which would have significant bearing on the plans of the state for assuring a sustained supply of water for Southern California.

In order to quantify these future water requirements for the basin area the Department of Water Resources is in process of intensive studies covering alternative methods of conveying and distributing Feather River water, the degree of re-use of return flows, and trends in the increasing rates of per capita water consumption. No estimates of prospective water requirements are presented in this report.

9. PAYMENT CAPACITY

We predict no problems on payment capacity for Feather River water in this area. Assuming development along the lines and magnitudes

indicated in the report, an adequate base of aggregate personal income and assessed valuation will be existent to underwrite the costs of imported water distribution facilities. Likewise it is our finding that, excluding considerations of water for irrigation use, the assumed water prices of \$50 to \$100 per acre-foot for municipal and industrial purposes will not inhibit growth. Water prices at these ranges are not a sufficiently important component of either residential or most industrial costs to be a deterrent to growth trends. There is therefore every reason to believe that the subject area could finance imported water.

10. INTERDEPENDENCE OF COASTAL AND DESERT BASINS

The Antelope-Mojave basin must be considered as an integral component of the Los Angeles metropolitan complex. As a future satellite community its development is immutably tied to the character and magnitude of expansion in the coastal basin over the next several decades.

Contrariwise, by virtue of its location and available expanse suitable for urban growth, the Antelope-Mojave area is important to the full realization of the growth potential of the central metropolitan community. Indeed, large-scale movement into the subject area may be considered as an inevitable concomitant and necessary condition of continued rapid growth for the entire metropolitan region. Without this great resource immediately adjacent to it, urban and industrial growth in the broad Los Angeles area might well become contained over the long-range future. The

existence and availability of the Antelope-Mojave area broaden the opportunities and prospects for massive growth in the entire Southern California region. Mutual interdependence is the character of the relationship which must govern the future development of both coastal and desert basins.

* * * * *

It has been a pleasure to work on this challenging assignment for you. We have derived a deep professional satisfaction from its performance and are hopeful that the report may be of assistance to the department in carrying forward its plans for the Feather River Project.

During the course of the survey we have appreciated the unfailing cooperation of Mr. Max Bookman, Mr. Robert M. Edmonston, Mr. Norman D. Sturm, and their associates in facilitating our work. We wish to express our gratitude to them. We shall be happy to render any additional assistance to you in connection with our survey and the resultant comprehensive report which follows.

Very truly yours,

(signed) BOOZ, ALLEN & HAMILTON

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APPENDIXES

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I. WATER RESOURCES AND THE DEVELOPMENT OF
SOUTHERN CALIFORNIA

I. WATER RESOURCES AND THE DEVELOPMENT OF SOUTHERN CALIFORNIA

The combination and interaction of many physiographic, economic, and social conditions will shape the future development of the Antelope-Mojave basin. Two basic factors, however, are of paramount importance to its growth: (1) the availability of water and (2) the effect of proximity to the Los Angeles metropolitan community. Unless the Antelope-Mojave area receives supplemental water its future is uncertain, with growth limited if not arrested. Similarly, the rate of growth of the basin will depend upon how rapidly and in which directions metropolitan Los Angeles expands.

Since the Antelope-Mojave area will be competing with adjacent districts for both water and urban activities, a brief review of the water resources and urban growth situation in the broad coastal region is presented as a perspective for our subsequent analysis of the subject area.

1. WATER SUPPLIES OF THE SOUTH COASTAL REGION

The entire coastal area of Southern California has been a water-deficient region almost from its civilized beginnings. Lacking in well-balanced seasonal rainfall, agricultural and urban pursuits have had to engineer the expansion of water supplies for each stage of growth. From simple irrigation diversions to elaborately constructed water distribution

systems, Southern California now has an intricate network of water developments that rank with mankind's great structural achievements.

(1) History of Water Development

The first development of water supplies in the coastal region took place along with the founding of religious missions in the latter part of the 18th century. This consisted of simple diversions of natural stream flows to areas of use. Supplemental waters were also developed in the early period by wells dug in the river gravels. During the 1880s the construction of reservoirs was begun for the purpose of giving better regulation of surface storage supplies. As the technology of well drilling progressed, underground water basins became an increasingly important source of supply to the extent that before the turn of the century water levels were beginning to drop at an alarming rate in some communities.

By 1900 it was evident that the Los Angeles coastal basin would have to supplement its water supplies from other regions if growth was to continue. The first major interbasin diversion was accomplished when the Los Angeles Aqueduct was completed in 1913, bringing water from the Owens Valley. In 1933 construction was started on a second major interbasin diversion - the transportation of water from the Colorado River. These two major sources of

importation have been of outstanding significance in supporting the growth of the Los Angeles metropolitan area.

(2) Present Water Sources

Water supplies for the south coastal region are currently furnished by three major sources: (1) local safe yield, (2) overdraft of ground-water basins, (3) importations from outside Southern California. A picture of the amount of water available from these sources can be derived from Table 1, following this page. It will be noted that in 1950, the latest date for which complete figures are available, surface runoff was providing a little over half of the water used, underground basins approximately one-fourth, and importations also about one-fourth. Since 1950, however, the amount of water annually imported from the Colorado River has increased more than 200% to keep pace with expanded development.

The water resources which have now been developed in Southern California support one of the most intensive, high level economies of any comparable area in the world. Population growth for the six counties of the south coastal area - Los Angeles, Orange, Riverside, San Diego, San Bernardino, and Ventura - advanced from less than 300,000 in 1900 to an estimated 7-1/2 million in 1957. As of 1950 water service in the south coastal region included 652,000 acres of irrigated lands and 547,000 acres of urban and suburban

TABLE 1

SOURCES OF WATER FOR
THE SOUTH COASTAL AREA
(Figures as of 1950)

August 1957

<u>Source of Supply</u>	<u>Acre-Feet per Year</u>	<u>Percent of Annual Consumption</u>
Surface Runoff	986,000	51.7
Underground Basins	450,000	23.6
Owens-Mono Aqueduct	305,000	16.0
Colorado River Aqueduct	166,000	8.7

Source: Bulletin No. 2 of the State Water Resources Board

areas. In recent years the amount of agricultural acreage has been slowly declining as urban development intrudes upon farm lands.

Despite extensive basin developments, not all parts of Southern California have been successful in meeting their water needs or in obtaining supplemental water supplies, so that some areas are now faced with critical shortages. Vast regions of the desert, as well as such areas as Ventura, do not at present have access to imported waters. Moreover, several other areas such as upper Santa Ana and San Juan Capistrano have not had sufficient supplementations from outside sources to provide for secure growth. Meanwhile, heavy overdraft upon underground basins continues in many districts. Thus, for many communities a precarious situation has developed which is producing intensive rivalry and competition for water, including extensive litigation over water rights.

2. FUTURE DEMAND FOR WATER IN THE COASTAL AREA

The rapid growth which has occurred in Southern California would not have taken place without the wise and forward-looking development of water supplies. Although, as indicated above, the growth of some specific communities has been retarded by lack of sufficient water, over-all regional development has not been held back because of inadequate resources. Unprecedented urban expansion in recent years, however, has rapidly

reduced surplus water margins. The prospects for further growth make additional water supplies for the south coastal area a matter of compelling urgency.

(1) Prospects for Population and Economic Growth

As discussed at length in Chapter VII, all trends indicate that Southern California will continue to experience several decades of continued population and economic expansion. The national rate of population and economic growth remains high and is likely to more than double the country's population in the next half century. California, and in particular Southern California, appears to be favored by continued great population increases not only because of a high birth rate but because the attractiveness of climate and economic opportunities is producing a high rate of westward migration. On the whole, the state has a youthful economy and a psychology of expansion which should give it particular advantages in future industrial growth.

An evaluation of trends and conditions indicates that over half of this anticipated population increase in the state should take place in the coastal area of Southern California, provided water resources are available. The center of this regional development will continue to be the Los Angeles metropolitan area. The entire Los Angeles

coastal plain will gradually become urbanized as population and industry move outward from established urban centers and as agriculture declines. Older areas, particularly along the coast, may be expected to grow to greater population densities, but in general the entire region may well come to have a much lower settlement density than is found in many established metropolitan centers. Large-scale agriculture will gradually decline in the Los Angeles plain to the point of extinction as the urban economy advances.

(2) Future Demand for Water

Growth in the magnitudes now predicted for Southern California will greatly increase the need for additional water supplies. Water currently used for agricultural purposes in the coastal area will be gradually converted to urban usage, but this alone will not be enough to service anticipated urban development. As matters now stand, the amount of water needed for future requirements in the coastal region could well exceed estimates formulated in recent years.

The forecasts of the California Water Plan are based upon an ultimate state population of approximately 42 million. The state water agency in 1950 forecast an increase in irrigated land in the south coastal area from 652,000 to an ultimate 1,156,000 acres, and an increase in urban and suburban acreage from 547,000 to 1,611,000 acres. It was further estimated that this would call for an increase

in annual water usage from the 1950 amount of 1,907,000 acre-feet to 5,552,000 acre-feet, or an additional 3,645,000 acre-feet per year. When allowance is made for evaporation and other losses this figure would rise to approximately 4,040,000 acre-feet per year.

The Department of Water Resources sees some expansion of existing water supplies in the south coastal area, but not enough to meet these future ultimate requirements without major diversions from northern California. It estimates that approximately 149,000 additional acre-feet per season could be developed from local supplies, but the balance (or approximately 80% of the total water requirements) will have to be met through interbasin importations. When ultimate importations of the Owens-Mono Aqueduct (320,000 acre-feet per year) and the Colorado River Aqueduct (1,212,000 acre-feet per year) are subtracted, it is estimated that an annual deficit of 2,878,000 acre-feet will exist. As indicated in Table 2, following this page, this requirement must be met by northern California diversions.

It becomes clear that upon the basis of present rates of growth and present supplies the south coastal area faces an inevitable water shortage within the space of 15 to 20 years. This circumstance confronts the region with the sobering prospects of an economic

II. PRESENT CHARACTERISTICS OF THE ANTELOPE-MOJAVE BASIN



TABLE 2

FUTURE SOURCES OF WATER SUPPLY
FOR THE SOUTH COASTAL AREA

August 1957

<u>Source</u>	<u>Acre-Feet per Year</u>	<u>Percent of Total</u>
Local Sources (Surface waters and underground basins)	1, 142, 000	20. 6
Owens River Aqueduct	320, 000	5. 8
Colorado River Aqueduct	1, 212, 000	21. 8
Northern California Diversions	<u>2, 878, 000</u>	<u>51. 8</u>
Total Ultimate Need	<u>5, 552, 000</u>	<u>100. 0</u>

Source: As projected by the State of California Department of Water Resources.

plateau in which growth is severely limited unless massive water diversions are obtained from the surplus of northern basins. Restrictions upon growth in Southern California could be of serious economic import both for the state and the nation. Planning for the construction of the Feather River and other northern California diversion projects, therefore, takes on an urgency of the highest priority.

3. RELATIONSHIP OF THE ANTELOPE-MOJAVE BASIN TO THE SOUTH COASTAL PLAIN

It is within this context and subject to these trends that the future development of the Antelope-Mojave area will take place. Long-range growth in the basin will be determined by the success in developing supplemental water and by the degree of urban growth which takes place in the south coastal region. This adjacent basin must be viewed as part of the growing Los Angeles metropolitan complex, with its rate of growth dependent on the growth and dispersal pattern which occurs on the coastal plain.

Subsequent chapters of this report analyze and appraise present characteristics and measure the influence of national and state growth factors as they impinge on the subject area. From this base, growth potential is then projected into the future.

II. PRESENT CHARACTERISTICS OF THE ANTELOPE-MOJAVE BASIN

The area encompassed by the survey is an arid, sparsely settled region which, in spite of a few rapidly growing communities, is still largely undeveloped in terms of both agriculture and industry. Its principal urban centers are Barstow, Lancaster, Mojave, Palmdale, Ridgecrest, and Victorville. With the exception of Barstow, these are unincorporated communities.

Located in the southern and western section of the Mojave Desert, the survey area covers some 7,600 square miles of territory - an area somewhat larger than the state of New Jersey. Included within its boundaries are 4,882,979 acres as follows:

734,760 acres in northern Los Angeles County

1,394,307 acres in eastern Kern County

2,753,912 acres in western San Bernardino County

On its east-west axis the subject area extends about 125 miles. The distance from north to south extremities is about 85 miles. Situated directly north of the Los Angeles-San Bernardino metropolitan community, the southern boundary of the basin area is some 30 airline miles from

the center of Los Angeles. Map B, following this page, presents topographic and political detail of the area.

1. PHYSICAL CHARACTERISTICS

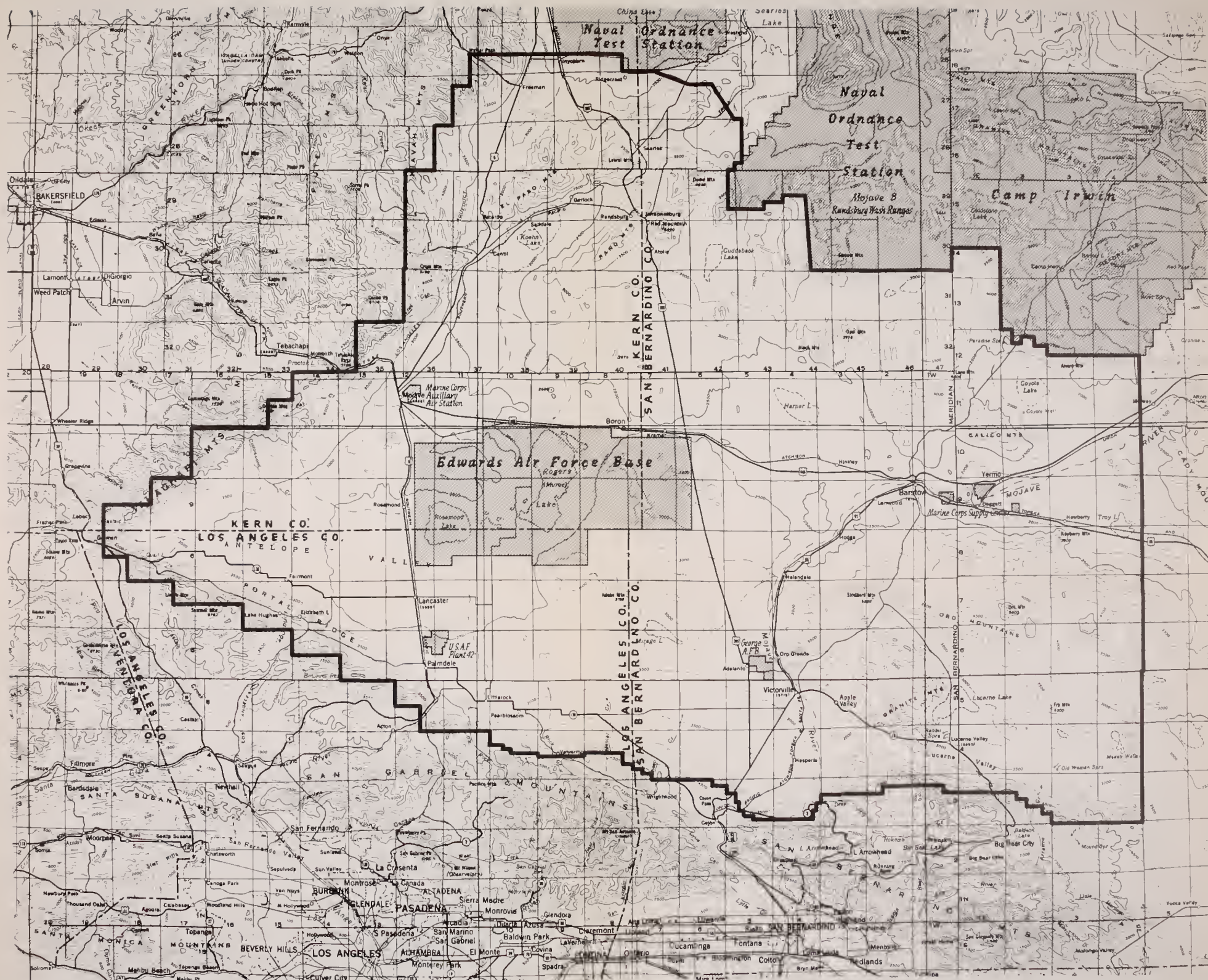
Bordered on the south by the rugged San Bernardino-San Gabriel Mountains and their westerly extension, the Sierra Pelona Range, and on the northwest by the Tehachapi Mountains, the Antelope-Mojave area consists of series of alluvial plains, valleys, dry lakes, buttes, and hills. The most prominent and most developed of these valleys, the Antelope, occupies the southwestern portion of the basin, mainly in Los Angeles County, but also partly in Kern and San Bernardino Counties.

The floor of the valleys ranges in elevation from 2,000 to over 3,000 feet above sea level. The highest point in the area reaches an elevation of slightly over 6,000 feet. By way of contrast, the surrounding mountains on the southern boundary of the area attain an elevation of 10,000 feet.

(1) Geology and Ground-Water Basins

The major topographic features of the area are the result of a series of crustal disturbances which occurred several million years ago, early in the Pleistocene period. Prior to that time, the mountain ranges and hills which form the southern and western boundaries were nonexistent. Uplift along the San Andreas Fault formed the





San Gabriel-Sierra Pelona Ranges. Similar displacement along the Garlock Fault created the Tehachapi Mountains. The effect of this activity was to produce a depressed region or structural basin.

During the millions of years following the disturbance, erosion dissected these newly formed mountains, and streams carried alluvial deposits into the basin. The valley floor is underlain by a heterogenous mixture of clay, silt, sand, and gravel, varying in thickness from a thin covering to deposits of unknown thickness in the basin centers.

The area's dry lakes have their geologic origin in the fact that during periods of torrential rains mountain runoff reached the lower parts of the basin to form shallow ponds, carrying finer particles of bed load. When the lakes subsequently evaporated, there remained a smooth flat residuum of clay or silt.

(2) Drainage

The survey area constitutes a self-contained drainage basin, no water flowing either into or out of the territory. The principal stream is the Mojave River. Together with its tributaries, it drains the northern slopes of the San Bernardino Mountain and flows in a northeasterly direction through the eastern section of the survey area. Except for infrequent flood flows, the river channel is dry for most of its course.

San Gabriel-Sierra Pelona Ranges. Similar displacement along the Garlock Fault created the Tehachapi Mountains. The effect of this activity was to produce a depressed region or structural basin.

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In Antelope Valley, the occurrence of surface water is the result of rainfall and snowfall on the surrounding mountainous tributary watersheds. The principal perennial streams in the San Gabriel Mountains are the Rock and Littlerock Creeks, and in the Tehachapi Mountains, the Oak and Cottonwood Creeks.

(3) Climatology

The climate of the Antelope-Mojave basin is characterized by wide temperature fluctuations, high summer temperatures, high wind velocity, low air moisture content, and scant rainfall.

An examination of precipitation data for weather stations in the area reveals several characteristic features. First, almost all of the precipitation occurs between December and March. Second, despite topographic variations which result in greater rainfall in the mountains than on the central part of the valley, the average annual precipitation is small - about five inches in the Mojave River district and less than eight inches in Antelope Valley. These amounts are so scant that irrigation becomes necessary for most agricultural crops. The temperature and precipitation data for several weather stations are summarized in Tables 3-1 and 3-2, following this page.

High summer temperatures and wide diurnal variations during most of the year are other features of the area's climatology. Summer temperatures frequently exceed 100° F. Winter temperatures

TABLE 3-1

TEMPERATURE SUMMARY -
SELECTED WEATHER STATIONS
(Data in °F)

August 1957

	<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Annual</u>
Palmdale (a)													
Highest	81	78	89	97	107	109	112	112	111	100	86	83	112
Mean Daily Maximum	56.3	59.2	65.6	73.3	80.3	88.1	97.2	96.4	90.7	78.9	67.6	58.6	76.0
Mean Daily	43.6	46.8	52.0	58.6	65.1	72.3	81.1	76.9	73.6	63.2	52.3	45.9	61.2
Mean Daily Minimum	30.8	34.3	38.5	43.9	49.9	56.4	65.0	63.5	56.6	47.5	37.0	33.1	46.4
Lowest	9	16	21	28	31	40	43	44	36	27	19	14	9
Llano (b)													
Highest	77	75	90	93	100	108	112	109	105	96	89	78	112
Mean Daily Maximum	54.2	58.1	63.7	71.0	79.2	88.3	95.4	94.4	88.0	76.2	64.3	56.1	74.1
Mean Daily	43.1	46.4	50.5	56.5	63.6	71.5	79.0	77.9	71.9	61.8	51.7	45.0	59.9
Mean Daily Minimum	32.1	34.6	37.3	42.0	48.0	54.8	62.7	61.3	55.8	47.4	39.2	34.0	46.5
Lowest	8	14	20	22	28	35	39	38	36	25	15	13	8
Barstow													
Highest (29 years)	82	86	94	99	111	114	114	113	112	102	91	87	114
Mean Daily Maximum (26yr)	59.5	64.2	70.7	78.3	85.5	95.6	102.3	100.7	93.4	81.6	68.0	61.3	80.1
Mean Daily (30 years)	45.7	50.1	57.9	62.2	68.7	77.6	84.0	82.5	75.1	64.4	53.8	46.4	64.0
Mean Daily Minimum (26 yr)	30.6	34.2	39.9	45.8	51.9	59.9	66.6	64.3	57.3	47.4	37.0	30.9	47.2
Lowest (29 years)	6	11	21	29	34	40	50	48	32	27	14	11	6

(a) Length of record 19 years

(b) Length of record 32 years

Source: United States Department of Commerce, Weather Bureau.

TABLE 3-2

PRECIPITATION SUMMARY -
SELECTED WEATHER STATIONS
(Inches of Precipitation)

August 1957

	<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Annual Average</u>
<u>Palmdale (a)</u>													
Greatest Monthly	5.59	7.24	4.92	2.37	0.40	0.21	0.22	1.38	1.89	1.63	3.37	7.55	7.55
Mean Monthly	1.36	1.89	1.69	0.46	0.12	0.03	0.02	0.32	0.22	0.38	0.48	2.15	9.12
Least Monthly	-	-	T	-	-	-	-	-	-	-	-	-	-
Greatest Daily	2.40	2.43	2.39	0.68	0.40	0.15	0.22	1.05	1.02	1.63	1.63	3.43	3.43
<u>Llano (b)</u>													
Greatest Monthly	7.45	8.06	5.06	4.31	1.44	1.50	1.50	1.60	1.86	3.01	3.40	7.78	7.61
Mean Monthly	1.26	1.47	1.26	0.54	0.16	0.07	0.12	0.25	0.20	0.38	0.46	1.44	N. A.
Least Monthly	-	-	-	-	-	-	-	-	-	-	-	-	-
Greatest Daily	6.45	4.15	2.27	1.24	1.00	1.05	1.50	1.13	1.58	1.21	2.05	2.75	6.45
<u>Barstow</u>													
Greatest Monthly (38 years)	3.39	2.47	3.50	1.28	0.99	2.97	1.28	2.79	1.50	3.39	2.00	3.87	N. A.
Mean Monthly (38 years)	0.77	0.60	0.71	0.17	0.09	0.09	0.19	0.24	0.17	0.35	0.28	0.59	4.25
Least Monthly (38 years)	-	-	-	-	-	-	-	-	-	-	-	-	-
Greatest Daily (30 years)	1.03	1.00	1.50	0.61	0.80	1.93	1.35	2.79	1.50	0.85	2.00	1.07	2.79
(a) Length of record 19 years													
(b) Length of record 35 years													
N. A. - Not available													
T - Trace													

Source: United States Department of Commerce, Weather Bureau.

below freezing are common. Bright sunshiny days followed by rapid cooling of air soon after sunset because of the high elevations create daily temperature ranges of 30° to 45° F. throughout much of the year.

The large number of days climatically suitable for flying was reported to have been one of the factors which weighed in the favor of Antelope Valley's selection as a site for flight testing of military aircraft. One community in this area reports 360 flying days per year with 260 days of sunshine, 40 partly cloudy days, and 65 cloudy days.

The area is also one of low relative humidity, a fact which tends to minimize the discomforts of temperature extremes. Portions of the area experience high wind velocities, particularly during the late spring months.

High temperatures, high wind velocity, and low humidity combined account for the high evaporation experienced at Bachus Ranch in Antelope Valley where, during the 13-year period from 1937 to 1949, the highest evaporation for the state was recorded.

The average length of the growing (frost-free) season covers a period of 215 to 245 days. Late spring frosts frequently damage fruit and nut acreage located in the southern part of the area.

2. POPULATION CHARACTERISTICS

Stimulated by the establishment of major military installations and the advent of defense aircraft production and flight-testing facilities, the Antelope-Mojave basin has experienced a remarkable rate of population growth since 1940. Despite these increases, the area is still sparsely populated and its urban communities are relatively small.

For the basin as a whole, population increased from 21,939 in 1940 to 60,015 in 1950, then rose to our present estimate of 131,000 in July 1957. Thus, between 1940 and 1950 total population increased by 173.5%, between 1950 and 1957 by 118.3%. For the entire 17-year period the increase was 497.1%. These statistics are reflected in Table 4, following this page, covering those portions of the three counties which lie within the survey area.

Even more striking than these over-all figures are the extraordinary population growth rates applying to principal urban centers since 1940, particularly the Lancaster and Palmdale census tracts in the Antelope Valley district. Lancaster, for example, has expanded from 3,463 in 1940 to 8,276 in 1950, growing then to the current estimate of some 27,000 in 1957. Likewise Palmdale, starting with 1,419 in 1940, has grown from 2,746 in 1950 to 14,486 in the current year. These population increases are presented in Table 5, following Table 4.

TABLE 4

POPULATION INCREASE
IN THE ANTELOPE-MOJAVE BASIN
1940-1957
August 1957

	<u>1940</u>	<u>1950</u>	<u>1957</u>
Kern County Portion	5,805	20,497	36,000
Los Angeles County Portion	7,729	16,084	53,000
San Bernardino County Portion	<u>8,405</u>	<u>23,434</u>	<u>42,000</u>
Total	<u>21,939</u>	<u>60,015</u>	<u>131,000</u>

Source: 1940 and 1950, United States Bureau of the Census.
1957 estimates for Los Angeles by Los Angeles County
Regional Planning Commission. Other estimates based
on data supplied by San Bernardino and Kern Counties
Planning Commissions and other groups.

TABLE 5

POPULATION INCREASE
IN THE MAJOR URBAN CENTERS
OF THE ANTELOPE-MOJAVE BASIN AREA

August 1957

<u>Urban Centers</u>	<u>1940</u>	<u>1950</u>	<u>Recent Estimate</u>
Barstow	2,547	6,135	10,017 (a)
Lancaster census tract	3,463	8,276	27,008 (b)
Mojave	1,241	2,055	3,700 (c)
Palmdale census tract	1,419	2,746	14,486 (b)
Ridgecrest-Inyokern	N.A.	2,292	5,225 (d)
Victorville	N.A.	3,241	6,300 (e)

N.A. - Not available

Source: 1940 and 1950, United States Bureau of the Census.

(a) Special United States Census, 1957

(b) Los Angeles County Regional Planning Commission,
July 1957

(c) Kern County Planning Commission, 1956

(d) Kern County Board of Trade, January 1957

(e) San Bernardino County Planning Commission, 1957

These statistics clearly mirror the effects of the establishment of such military installations as the Naval Ordnance Test Station at China Lake near Ridgecrest during the '40s and the build-up at Edwards Air Force Base during the '50s. Both of these facilities are principally in Kern County. Much of the population growth in the Los Angeles County section during the '50s was triggered by the establishment of the aircraft industry at the Palmdale airport.

Factors other than military and defense production have also, however, been responsible for the in-migration of population. There has been a general awakening of interest in the desert region during the post-World-War II period. The area has had particular appeal to those who have tired of the congestion of city life and who seek a new start in an area regarded as offering frontier opportunities. It also has shown considerable attraction to the retired or those seeking a weekend retreat. Several real estate developments have sprung up in the area, catering to these demands. Among the more widely publicized and aggressively promoted of these are Apple Valley and Hesperia, both in San Bernardino County. Between 1950 and 1957, the former has increased in population from 1,300 to 2,800, while the latter has increased from 700 to 3,100.

In the absence of recent census data, it is difficult to be specific in terms of the characteristics of the population or their point of origin. An analysis of the types of industry in the area, birth rate statistics, and

community surveys indicates the likelihood that the population in the Antelope-Mojave basin is relatively youthful. A recent Palmdale survey, for example, disclosed that only 3.3% of the community's population were age 65 or over. Nationally, persons in this age category represent about 8% of the total population.

People have migrated to this desert area from many parts of the country. As might be expected, a good many have come from adjacent metropolitan centers and from San Joaquin Valley. Included among the out-of-staters are the workers who were recruited in the East and Midwest by the aircraft manufacturers for their Antelope Valley facilities.

3. GENERAL ECONOMIC PATTERN

The marked expansion of economic activity in the Antelope-Mojave area during the past decade has been attributed mainly to the increase in military and defense activities. At the same time, the area's resource-based industries such as the manufacture of portland cement and the processing of borate products have increased as the result of the growth of demand in the regional or national markets they serve.

By virtue of the important transportation thoroughfares passing through the area it has also benefited from increases in the movement of goods and people, symptomatic of the progressively expanding level of national economic activity. These factors have combined to create a

demand for expansion in the other industries: service, trade, construction, transportation, utilities, and finance.

Agriculture in the Antelope-Mojave area has also increased, but has not been a major contributor to the recent period of rapid expansion. There is evidence that farming, once the major economic activity here, is now beginning to decline. Some farm workers are shifting to nonagricultural jobs, and farm lands have been caught up in the demand for residential subdivisions.

In subsequent chapters, the industrial, transportation, defense, and agricultural sectors of the area's economy will be treated at length.

4. LABOR FORCE

It is difficult to obtain a reliable measure of the total size of the civilian labor force, or of employment and its distribution by major industries. The best available information suggests that average employment during 1956 over the entire area was in excess of 50,000 persons. The farm employment sector of this figure is estimated to have varied between 5,800 and 7,200, reaching the latter during the harvest season. On a year-round basis, poultry farms were the principal source of agricultural employment.

Current reliable statistics on nonagricultural employment by industry are not available for the entire area. However, a labor market survey

of the Lancaster-Palmdale area is made from time to time by the state's Department of Employment. The results of the most recent surveys are shown in Table 6, following this page.

The table points up the rapid expansion in the labor market. It will also be noted that increases in manufacturing employment, principally at the Palmdale airport, stimulated employment expansion in most of the nonmanufacturing industries, notably construction.

Nonagricultural employment is dominated by the military and the aircraft industry. A facility-by-facility examination shows that these activities employ in the neighborhood of 20,600 civilians. Of these, 10,100 are employed by aircraft industry contractors located at Edwards Air Force Base, Mojave Air Station, and the Palmdale airport. The other 10,500 are employed directly by the government and also work at these three facilities as well as at the Naval Ordnance Test Station, Marine Corps Supply Center, George Air Force Base, and Camp Irwin.

Wage rates received by male workers in the Antelope-Mojave basin are generally as high and, in some occupations, higher than those received by persons performing comparable jobs in other communities in Southern California. Among the factors which account for this situation are:

- (1) There has been a history of labor shortage in portions of the area. In some communities of Mojave Valley a "desert pay" bonus has had to be paid by the transportation industry in order to assure an adequate supply. Similar incentives are being paid to technicians employed by some of the aircraft industry contractors at Edwards Air Force Base.

TABLE 6

EMPLOYMENT BY INDUSTRY (a)
 COMMUNITIES OF
 LANCASTER AND PALMDALE
 August 1957

<u>Industry</u>	<u>July 1955</u>	<u>Percentage Distribution</u>	<u>July 1956</u>	<u>Percentage Distribution</u>	<u>Percent Change 1956/1955</u>
Agriculture, Forestry, and Fishing	300	3.4	300	2.8	0.0
Contract Construction	800	9.0	1,100	10.3	+37.5
Manufacturing	2,900	32.6	3,800	35.5	+31.0
Transportation, Commu- nications, and Utilities	400	4.5	500	4.7	+25.0
Wholesale and Retail Trade	2,200	24.7	2,400	22.4	+ 9.1
Finance Insurance and Real Estate	200	2.2	200	1.9	0.0
Service	1,700	19.1	1,900	17.7	+11.8
Government (b)	<u>400</u>	<u>4.5</u>	<u>500</u>	<u>4.7</u>	<u>+25.0</u>
Total	<u>8,900</u>	<u>100.0</u>	<u>10,700</u>	<u>100.0</u>	<u>+20.2</u>

(a) Employment figures include wage and salary workers, self-employed, unpaid family workers, and domestics.

(b) Excludes those engaged in work also performed by private industry; such government employees are included in the count of their particular industry.

Source: California State Department of Employment.

- (2) Growing unionization and the trend toward region-wide wage agreements have tended to equalize pay levels for persons in the construction trades, large retail chain stores, certain service trades, and the aircraft industry.

Aside from clerical and office positions there is little demand for women workers in manufacturing industries. The principal demand for women is from the service and trade industries. For these reasons, the wage rates for stenographic and typing skills are somewhat less than in the metropolitan centers.

5. LAND OWNERSHIP, USE, AND CLASSIFICATION

One of the principal resources of the Antelope-Mojave basin area is the land itself. This vast region is at present largely unoccupied; most of it, however, is suitable for habitation.

(1) Extent and Availability of Public Lands

An undeterminable but considerable amount of land in the subject area is owned by the state or federal governments. Precise maps showing the location of public lands, other than those reserved for the armed forces and public agencies, are not available. These lands are located broadly in the eastern and northern areas of the basin.

The total number of acres of land owned by the federal government throughout all of Kern, Los Angeles, and San Bernardino Counties is shown in Table 7, following this page. The figure for

TABLE 7

AREA OF UNAPPROPRIATED OR UNRESERVED
PUBLIC LAND AS OF JULY 1, 1955

August 1957

<u>Total County</u>	<u>Area in Acres outside Grazing Districts</u>	<u>Area in Acres inside Grazing Districts</u>	<u>Total</u>
Kern	128,613	619,259	747,872
Los Angeles	28,885	-	28,885
San Bernardino	7,748,577	124,131	7,872,708

Source: United States Department of the Interior, Bureau of Land
Management,

San Bernardino represents better than 60% of the total land area of the county. Public lands in Kern County represent 14% of the total. Only a minor portion of Los Angeles County is comprised of public lands.

Within the past few years, one of the most widely used methods for private acquisition of government lands in Southern California has been under the terms of the Small Tract Act. This provides that small tracts of public land not exceeding five acres may be leased or sold if they are or may be classified as chiefly suitable for residential, recreational, business, or community sites. Persons may also apply for land which has not been so classified as yet. Before it can be acquired, however, it must be surveyed and classified by the Bureau of Land Management of the United States Department of the Interior.

The public has demonstrated a keen demand for public lands in the desert. In March of 1957, the Los Angeles office of the Bureau of Land Management initiated a series of public auctions at each of which 100 small tracts, averaging five acres in size, were to be offered. The first of these, according to newspaper accounts, attracted 1,200 persons. After spirited bidding, the first tract of five acres was sold for \$700.

By rough estimate there are 5,000 to 6,000 parcels of land within the San Bernardino portion of the basin area which have been acquired or are in the process of being acquired under the terms of the Small Tract Act. These vary in size from one acre to five acres, and are located principally in the areas east of Hesperia to Lucerne Valley, and south of Barstow.

A number of reasons have been advanced to explain the strong interest which has been evidenced in public lands in the desert. It has been hypothesized that the greatest number of these people are motivated by the desire for a weekend or retirement homesite. Others are attracted by the possibilities for profit through appreciation of land values. There are also others who are looking for a permanent homesite in the desert.

(2) Land Use Pattern

An examination of the present land usage pattern emphasizes that little of this enormous area is in use, only 10% now being devoted to purposeful human activity. As may be seen in Table 8, following this page, the military is the largest user of land. Agriculture, the second largest user, occupies a much smaller area.

The number of acres at present devoted to urban, commercial, and industrial purposes is minute when compared to the total land

TABLE 8

PRESENT USAGE OF LAND BY PURPOSE
IN ANTELOPE-MOJAVE BASIN AREA

August 1957

<u>Usage</u>	<u>Acres</u>
Agriculture	
Irrigated	104,269
Nonirrigated	<u>51,128</u>
Total	155,397
Urban, suburban, commercial, industrial, and other uses	12,155
Military	327,604
Undeveloped	<u>4,387,823</u>
Total	<u><u>4,882,979</u></u>

Source: Agricultural acreage computed from reports and information supplied by Agricultural Commissioner's offices of Kern, Los Angeles, and San Bernardino Counties.

Other acreage data supplied by California State Department of Water Resources.

available. However, it should be noted that subdivision plans submitted to county authorities reveal a considerable amount of additional acreage earmarked for residential purposes. Since 1955, there have been in excess of 40,000 residential building sites and the necessary access streets subdivided in the Victorville, Apple Valley, Hesperia, and Lucerne Valley areas. In the Barstow area, some 28,000 residential building sites have been subdivided.

Of importance to any consideration to the future prospects of an area is a determination of the potential land use pattern. Based on land classification surveys, it has been estimated that 2,155,900 acres of land in the investigational area are irrigable, representing 44% of the total. This land could also conceivably be used for urban purposes. Additionally, there are 996,500 acres of land which are nonirrigable but habitable. Typically, these are in the foothills or other areas which are less than ideally suited for agriculture. In total, then, there are 3,152,400 acres of habitable land in the Antelope-Mojave basin area, or 65% of gross area.

Considering only the 2,155,900 acres of potentially irrigable land, Table 9, following this page, presents by county the amounts which might be available for and suitable to farm production. This indicates that even after deductions have been made for rights of way,

TABLE 9

ESTIMATED PRESENT AND POTENTIAL LAND USE
ANTELOPE-MOJAVE BASIN
(Acres)

August 1957

<u>Portion of County</u>	<u>Gross Area</u>	<u>Irrigable Land</u>	<u>Farmsteads, Railroads, Roads, Canals</u>	<u>Net Prod- uctive Irrigable Land^{1/}</u>	<u>Present Irrigated Land</u>	<u>Potentially Irrigable Land</u>
Kern	1,394,307	609,880	91,480	518,400	23,732	494,668
Los Angeles	734,760	490,910	73,635	417,275	60,483	356,792
San Bernardino	2,753,912	1,055,110	158,270	896,840	20,054	876,786
Total	<u>4,882,979</u>	<u>2,155,900</u>	<u>323,385</u>	<u>1,832,515</u>	<u>104,269</u>	<u>1,728,246</u>

^{1/} The portion of gross irrigable acreage which would be irrigable in any year after deducting allowances for rights of way, roads, farmsteads, and crop rotation or fallowing practices. For this area, net was computed as 85% of gross area.

Source: Gross area, irrigable land, and net irrigable land from data supplied by the California State Department of Water Resources.

Presently irrigated land computed from reports and information supplied by Agricultural Commissioner's offices of Kern, Los Angeles, and San Bernardino Counties.

roads, crop rotation, etc., an amount equal to 16 times the acreage now devoted to agriculture remains.

(3) Land Values

The value of the land has naturally increased as a consequence of the rising level of economic activity. In some areas, speculation has created market prices that are more a reflection of optimistic appraisals of future growth prospects than of present intrinsic values. The current asking or sales price of land varies according to the locality, the purpose for which it may be used, and the status of development, in terms of the availability of utilities, roads, and services. Raw desert land in remote areas and without proven water resources and utilities is obtainable at \$150 an acre. In large parcels, it probably can be acquired at a fraction of this price. Land which is located in the path of a settled community's growth, and suitable for residential subdivision, may be acquired at from \$2,000 to \$3,000 an acre. In the agricultural areas, land at present used for dry land farming is reported to be available at prices ranging from \$250 to \$500 an acre. Irrigated farm land is offered at prices ranging from \$400 to \$1,000 an acre.

Land suitable for industrial uses is available in a wide range of parcel sizes and prices in the principal communities in the area. In the present industrial zones, parcels ranging in size from one

acre to several hundred acres are available. The prices vary widely, depending upon the specific locality and the availability of utilities, rail lines, and sewage disposal facilities. The limits of the range are reported to extend from several hundred dollars to \$5,000 an acre.

6. WATER RESOURCES AND PROPORTIONAL USES

Local underground supplies comprise the principal sources of water for the Antelope-Mojave basin area. The major contribution to ground-water recharge comes from stream runoffs, the largest of which are Rock Creek, Littlerock Creek, and Mojave River. Because of the scant rainfall, there is no appreciable contribution from precipitation.

Pumped water supplies all of the area's domestic, municipal, and industrial needs as well as 90% or more of agricultural requirements. The remainder of farm needs are supplied by diversion of surface water in the Palmdale and Littlerock Irrigation Districts and in the Mojave River area. The surface and ground water used or pumped is generally of good quality with the exception of localized areas where high conductivities, sulfates, or boron concentrates prevail.

(1) Available Supplies

The total present supply of ground water in the area has not been determined. In his study, "Ground Water in California, The Experience of Antelope Valley," Professor J. Herbert Snyder

estimated that the original stock ground-water resource, to a depth of 500 feet, amounted to about 10,000,000 acre-feet. By 1951, this had been reduced to 8,000,000 acre-feet. The decrease has been the result of the almost persistent extraction of water from the ground in excess of the natural replenishment or recharge.

The extent to which the area is "mining" its water supply has been increasing and directly affects the expansion of the local economy. In particular, this situation impairs the predominant role of irrigated acreage in the agricultural picture. It has been estimated that the volume of ground water permanently removed from storage in Antelope Valley has increased from 27,000 acre-feet per year in 1924 to 206,000 acre-feet in 1954.

(2) Proportional Uses

Irrigated agriculture is the principal user of water throughout the area. Professor Snyder estimated that alfalfa, the major irrigated crop, used 80% of the total net draft on ground water in Antelope Valley during 1951, and that all agriculture used almost 99%. The United States Department of the Interior study, "Report on Victor Project, California," estimated that in the Mojave River area, irrigated agriculture took about 59% of the total consumptive use of water during the year 1950 to 1951, with native vegetation accounting for another 39%.

Based on these findings, the proportional uses of water by major user types have been estimated, for the entire area in 1956, at 96.9% for agricultural purposes (including consumptive use by native vegetation) and at 3.1% for all domestic, military, and industrial uses. This highlights the very nominal demands which urban requirements have made on the area's water resources up to the present. At the same time, it is well to recognize that this sector's share of the total is rapidly increasing.

(3) Overdraft Status and Pumping Levels

Symptomatic of the overdraft of the ground-water resources have been the declines in ground-water levels, particularly in Antelope Valley. Annual observation of a well near Lancaster by the United States Geological Survey shows that during the past 25-year period the water level has declined 143 feet. During the current dry period dating from 1943, the rate of decline has been 8.1 feet per year. In the upper Mojave River area, around Victorville, the decline during the past 25 to 40 years has not been so large - in the order of 15 to 20 feet.

At the present time pumping levels in the Mojave River district range from 30 to 40 feet along the river to 150 feet in other areas. In contrast, wells in the Antelope Valley section must penetrate much deeper to find an adequate flow of water. While there are some wells

of less than 100-foot depth, more commonly they range from 250-feet to 400-feet or more in Antelope Valley.

(4) Current Water Costs

The cost of water, including as it does the energy charge for pump lifting, has increased considerably. A recent unpublished survey of water resources in Antelope Valley estimates that the average cost per acre-foot of ground water pumped has increased 75% between 1950 and 1956.

Based on interviews with a selected number of farmers, current energy costs for pumping range from \$5 to \$8 an acre-foot in Antelope Valley, and from about \$1 to \$3 in the Mojave River area. These variations reflect the differences in the total pump lift, pumping plant size, plant efficiency, and amounts of water supplied. A commonly used rule of thumb in Antelope Valley is that total water production costs (including repairs, depreciation, maintenance, and energy) are twice the amount of energy costs alone.

The urban cost of water in Antelope-Mojave is reasonable and compares favorably with that of communities in the coastal region.

(5) Comparison of Water Resources in the Two Districts

It is generally believed that, in terms of present demand, the Mojave River area is more comfortably situated with regard to water

resources than is Antelope Valley. The greater depth to ground water as well as the faster rate of drop in water levels in the latter area has already been noted. In addition, based on long-term averages, the natural replenishment or recharge compared to usage is nominal in Antelope Valley and substantial along the Mojave River.

7. UTILITY AND COMMUNITY FACILITIES

The utilities that serve the Antelope-Mojave basin area have undertaken major expansion programs to keep pace with the growing market. The great population increase in specific localities has complicated facilities planning and, at times, equipment and service have lagged behind demand. Generally, however, this has not retarded the area's growth. Indeed, construction expenditures and expanded personnel needs of the utilities have added to the growth of the area.

Electric utility service in the Antelope Valley area is provided by Southern California Edison Company. Communities served by this company include Palmdale, Lancaster, Mojave, and Rosamond. California Electric Power Company, headquartered at Rialto, serves the Mojave River Valley area as well as the communities of Cantil, Ridgecrest, Johannesburg, and Randsburg.

Two major natural gas transmission lines traverse the area. The Southern California Gas Company provides city main service to communities

in Antelope Valley including Lancaster, Palmdale, Mojave, Quartz Hill, and Rosamond. This company's pipeline, completed in 1957, will supplement the supply available at present from the Pacific Gas and Electric Company line at Mojave.

In the Mojave River area, the Southwest Gas Corporation serves Barstow, Victorville, Daggett, Adelanto, Oro Grande, Helendale, Apple Valley, and Lucerne Valley. The company has also been certificated to serve Hesperia. Its fuel supply is the Pacific Gas and Electric Company line.

Three companies provide telephone service within the area. These are Pacific Telephone and Telegraph which serves the Palmdale area; General Telephone Company serving the Lancaster area; and California Interstate Telephone Company which serves the remaining population centers. The latter company moved its headquarters from Bishop to Victorville in 1956 because of the great growth it has experienced in the desert area and its projections of future increases.

According to the tabulation which appeared in the State Water Resources Board publication, Bulletin No. 2, there were about 60 agencies which were authorized to sell water for domestic, irrigation, or other uses in the Antelope-Mojave basin area during the period 1950 through 1954. These include 13 commercial water companies, 40 mutual water companies, and 7 public water districts. Included in the latter are the

irrigation districts, county water districts, and county waterworks districts. Only 4 of the mutual companies serve as many as 100 customers.

The principal water service agencies in the area include the Los Angeles County Waterworks District No. 4 (Lancaster); Palmdale Irrigation District; Southern California Water Company (Barstow); Victorville County Water District; and Ridgecrest Water Supply.

In common with fast-growing cities in other parts of the country, those in the subject area face the problem of providing their increasing population with the essential community facilities. These include schools, streets, fire control, sewerage and water system, and public buildings. A particularly critical problem is that of public schools. Despite a high level of construction, schools are crowded and two-session days are utilized in a number of elementary schools. An indication of the size of the school construction program which has had to be undertaken is provided by Lancaster. The community had three elementary schools at the end of 1955. During 1956 two additional schools were constructed, with two or more scheduled to be completed in 1957. Present plans call for the construction of eight additional elementary schools by 1960.

8. INCOME AND FINANCIAL STATISTICS

Personal income statistics are a significant indicator of an area's economic development and status. They provide an important clue to its

ability to pay for goods and services, including public works. The absence of precise income data for the subject area has required that estimates be interpolated from county-wide figures and other available sources.

Assessed valuation and tax rate levels are important to appraising the area's ability to pay for public works. A general evaluation of the area's ability to attract investment capital is also discussed in the following sections:

(1) Personal Income Estimates

An examination of the estimates of personal income, by counties, prepared by the California State Chamber of Commerce, provides the starting point for the development of related estimates for the Antelope-Mojave basin. The 1956 per capita estimates for the three counties in which the area lies, as well as for adjacent counties, are enumerated in Table 10, following this page.

In determining how the level of personal income in the Antelope-Mojave area might compare with other counties, the following factors were considered:

1. The 1950 census of population - the last complete and authoritative enumeration - disclosed that the average income received by families and unrelated individuals during 1949 in three of the principal communities in the investigational area exceeded the averages for the county in which they were located. The county average was \$3,118 for Los Angeles, and \$2,700 for San Bernardino. In Barstow the figure was \$3,701; for Victorville, \$3,031, for Lancaster, \$3,259.

TABLE 10

PER CAPITA PERSONAL INCOME (a)
BY COUNTIES, 1956

August 1957

<u>Total County</u>	<u>Amount</u>
Kern	\$2, 181
Los Angeles	2, 545
San Bernardino	1, 902
Three Counties (weighted average)	2, 486
Orange	1, 722
Riverside	1, 777
San Diego	2, 244

Source: Personal income estimates by Research Department,
California State Chamber of Commerce. Population
estimates from several sources.

(a) Personal income includes revenue from all sources - wages
and salaries, commissions, proprietors' income, interest,
dividends, rents, pensions, social security receipts, military
pay, etc.

2. It has already been noted that current wage rates for various occupational categories in the communities of the subject area compare favorably with those in other cities in Southern California.
3. Aircraft production workers, the largest occupational category in the area, receive higher wages than do production workers in other industries. For example, in 1956 in the Los Angeles-Long Beach metropolitan area the average weekly earnings were \$97.20 in aircraft as against \$89.84 for other factory workers. The predominance of aircraft workers in the manufacturing industries of the area would tend to result in a relatively higher level of income.
4. Returns to Antelope-Mojave area farmers are believed to be somewhat less than the amounts received by farmers in competitive areas, such as the lower San Joaquin Valley. This is attributed to the cropping pattern and the prices realized.

A consideration and weighing of all these factors in the light of a comparative economic analysis resulted in a per capita personal income estimate in the magnitude of \$2,400 for 1956 for the survey area. This compares very favorably with the surrounding region.

(2) Bank Deposits

The total bank deposits of individuals and business in the survey area as of the end of 1956 were \$65,182,000. Indicative of the great growth in the area is the fact that such deposits amounted to only \$20,356,000 at the end of 1950.

The area's banking facilities have greatly expanded to meet the growing needs of the area. At present the area is served by branches

of three of the state's largest branch banking systems as well as by a branch of a Riverside County bank, and a locally owned bank.

(3) Assessed Valuation

Reflecting the increases in population and the level of economic activity, the assessed valuation of property in the area has increased sharply since 1950. It will be seen from Table 11, following this page, that the area-wide increase has been 160.4%. These figures provide a measure of the growing capacity of the area to pay for public improvements through bonded indebtedness.

It is well to recognize that assessed valuation is not the same as market or appraised valuation. Surveys conducted by the State Board of Equalization indicate a state-wide average ratio of assessed to appraised valuation in the neighborhood of 25%. In Antelope Valley, partially because of the increases in real estate prices as the result of speculative activities, assessed valuation is reported to represent less than this ratio.

To meet the needs of their growing population, a number of bond issues have been approved by the electorate for the construction of schools, sanitation, waterworks, fire control, cemetery, lighting, and hospital facilities. Generally, the area has used only a nominal amount of its bonding capacity with the exception of school

TABLE 11
 ASSESSED VALUATION
 ANTELOPE-MOJAVE BASIN AREA (a)
 August 1957

<u>Year</u>	<u>Kern County Portion</u>	<u>Los Angeles County Portion</u>	<u>San Bernardino County Portion</u>	<u>Total Area</u>
1951/1952	\$13,784,355	\$21,982,150	\$29,308,470	\$65,074,975
1956/1957	\$24,212,820	\$75,386,650	\$69,885,440	\$169,484,910

Source: Published reports, Auditor's Office of each county.

(a) Does not include government properties.

districts. In common with such districts in fast-growing communities throughout the region, those in the basin are at maximum bonding levels, a condition which enables them to qualify for state funds.

(4) Tax Rates

An indication of the current tax rates in various communities in the area is given in Table 12, following this page. It should be borne in mind that the total tax bill depends on where the property is located with respect to special districts, such as sanitation and fire. In each of the following, most of the special districts have been included. Because the ratio of assessed to appraised valuation is low, actual taxes are nominal.

(5) Capital for Construction

Considerable amounts of capital have been needed to finance the construction of homes and commercial structures which have been built in the area as a result of the vast increases in population. In 1956, for example, building permits valued at \$21 million and covering 1,750 dwelling units were issued in Lancaster. This number exceeded that of any incorporated city in Los Angeles County with the exception of Los Angeles, Long Beach, and Torrance.

The availability of funds from either local or outside capital sources varies among the communities and is also a function of the

TABLE 12

CURRENT TAX RATES
IN SELECTED COMMUNITIES
IN THE ANTELOPE-MOJAVE BASIN AREA
(Per \$100 of Assessed Valuation)

August 1957

	<u>Barstow</u>	<u>Lancaster</u>	<u>Palmdale</u>
County General	\$1.38	\$1.8322	\$1.8322
Library	.06	.0895	.0895
Road	-	.0427	.0427
Schools	3.19	3.3153	3.3000
Sanitation Districts	-	.7661	1.6005
Sewer Maintenance District	-	.0661	.0524
Water District	-	.1546	(a)
Fire	.42	.5276	.5102
Flood Control	.17	-	-
Cemetery	.06	.0123	-
Park	.14	-	-
Hospital	-	.1592	.1592
Lighting	-	.2101	.3012
City	<u>1.20</u>	<u>-</u>	<u>-</u>
Total	<u>\$6.62</u>	<u>\$7.1757</u>	<u>\$7.8879</u>

(a) The Palmdale Irrigation District levies an annual assessment of \$4.50 per acre. Lots of smaller size pay a proportionately smaller amount.

Source: County Auditor Reports of respective counties.

general condition of the national money markets. Communities like Palmdale and Lancaster have attracted considerable amounts of outside capital, particularly from the Los Angeles area. Much of the residential mortgage lending has had the Veterans' Administration or Federal Housing Administration feature. In Mojave and Ridgecrest, on the other hand, it was reported that construction of housing facilities has been hampered at times by the lack of government insurance or loan guarantee feature for investment capital.

III. THE FUTURE FOR AGRICULTURAL DEVELOPMENT

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III. THE FUTURE FOR AGRICULTURAL DEVELOPMENT

Since irrigated agriculture is such a heavy user of water compared with domestic and industrial consumption, future water demand in the Antelope-Mojave basin will be significantly affected by possible changes in agricultural development. The primacy of agriculture's influence on water requirements in this and similar areas arises from the fact of a considerably higher gross use per acre for irrigation than for urban and industrial purposes. In terms of net or consumptive use, irrigation takes an even greater proportion. Consequently, the agricultural outlook will have a vital bearing on the volume of supplemental water required in the subject area in the decades ahead.

At the present time, as already noted, agriculture in the Antelope-Mojave area absorbs about 97% of net water consumption. Even with greatly accelerated increases in population and industrial development, it will be many years before urban and industrial use of water reaches the current volume of agricultural use.

1. THE CURRENT AGRICULTURAL SITUATION

Because the Antelope-Mojave area is an arid region, agricultural development has historically been dependent upon success in obtaining an

adequate water supply. Early attempts to obtain water were by surface diversions of mountain streams in the Antelope Valley district and by diversion of the Mojave River. In both areas, the available supply of water soon proved inadequate, and development of ground water was initiated shortly after 1900.

In the Antelope Valley section, dry land farming was begun as early as the 1870s. Shortly thereafter thousands of acres of fruit trees were planted to be irrigated from stream diversion. After an extended period of drought and the realization that surface streams failed to provide a reliable source of water, a more stable agriculture began to be developed on the basis of ground water. There gradually emerged a pattern of agriculture similar to that in existence today, with alfalfa the most important crop, followed by dry land grains and small acreages of other irrigated forage crops, fruits and nuts, and vegetables.

Agricultural development in the Mojave River valley area followed a somewhat similar course to that of Antelope Valley except that insufficient rainfall precluded dry land grain farming. Though the Mojave River provided a somewhat more dependable source of water than did the streams of the Antelope Valley region, pumping from wells soon became the principal source of irrigation water. At one time deciduous fruits were extensively planted and thought to hold great promise. Gradually, however, a cropping pattern similar to that in the Antelope Valley area began to form and has continued to the present.

An important livestock industry, principally beef cattle and sheep, has existed throughout the subject area for many years. In recent years, fryer and turkey production has expanded to become the most important livestock enterprise.

(1) Agricultural Income and Land Use Patterns

The total value of all agricultural production in the subject area during 1956 was \$44,095,950. Of this, crops accounted for 39% and livestock for 61%. The total area devoted to crops in 1956 amounted to over 155,000 acres, with another 45,500 acres remaining fallow. Of the area harvested, nearly 100,000 acres were located in the Los Angeles County section, principally in the areas to the east and west of Lancaster. Another 35,000 acres were located in Kern County, principally to the west of Rosamond and around Cantil. The remaining 20,000 acres were in the Mojave River valley area of San Bernardino County.

Table 13, following this page, shows the agricultural land use pattern in the basin during 1956 for each of the three counties. It is immediately evident that almost all of the land was devoted to field crops, principally alfalfa and grain. The small remaining acreage was devoted to irrigated pasture, miscellaneous field crops, fruit and nut crops, and vegetables.

TABLE 13

AGRICULTURAL LAND USE IN 1956
ANTELOPE-MOJAVE BASIN AREA
(in Acres)

August 1957

<u>Use</u>	<u>Kern County Portion</u>	<u>Los Angeles County Portion</u>	<u>San Bernardino County Portion</u>	<u>Area Total</u>
<u>Fruits and Nuts</u>				
Almonds	-	1,700	-	1,700
Apples	-	110	133	243
Grapes	-	80	12	92
Peaches	-	518	10	528
Pears	-	300	12	312
Other	-	<u>160</u>	<u>-</u>	<u>160</u>
Total	-	<u>2,868</u>	<u>167</u>	<u>3,035</u>
<u>Field Crops</u>				
Alfalfa hay	7,185	35,900	12,604	55,689
Alfalfa seed	6,450	2,040	980	9,470
Irrigated pasture	184	4,000	2,355	6,539
Grain and grain hay	18,285	50,210	1,428	69,923
Miscellaneous	<u>2,874</u>	<u>4,190</u>	<u>2,281</u>	<u>9,345</u>
Total	<u>34,978</u>	<u>96,340</u>	<u>19,648</u>	<u>150,966</u>
<u>Vegetables</u>				
Cantaloupe	-	180	-	180
Watermelon	-	15	-	15
Onions	345	70	230	645
Potatoes	63	400	-	463
Miscellaneous	<u>-</u>	<u>85</u>	<u>8</u>	<u>93</u>
Total	<u>408</u>	<u>750</u>	<u>238</u>	<u>1,396</u>
Total All Crops	<u>35,386</u>	<u>99,958</u>	<u>20,053</u>	<u>155,397</u>

Source: Computed from annual reports and information supplied by the Agricultural Commissioner's Office in each county.

Of the 155, 397 acres under cultivation in 1956, 67% were irrigated. In the San Bernardino County portion, all agricultural acreage was irrigated. In Kern County, the ratio was 67%; in Los Angeles County, 60%. The nonirrigated acreage in the latter two counties was devoted principally to dry land grains.

(2) Current Crop Production

The value of all crops produced in the area amounted to nearly \$17 million during 1956. Alfalfa hay and seed accounted for over \$10 million of this total, making alfalfa clearly the dominant crop for the entire area. Since the basin is subject to generally uniform climatic and soil conditions, cropping patterns tend to be similar in the various districts. However, there are marked differences in the relative importance of the various crops produced within the various sections of the area as indicated in the following discussion by counties. Table 14, following this page, gives a breakdown by crop and county in dollar value of production.

1. Kern County

Almost the entire agricultural acreage in the Kern County portion is planted in field crops. Of these crops, alfalfa for hay and seed and grain crops, both irrigated and dry farmed, comprise 90% of all cropland.

As shown in Table 15, following Table 14, this area is the only one which has shown any agricultural expansion in the last few years. Total cropland has increased from about 26,000 acres in 1953 to over 41,000 in 1956. During the same

TABLE 14

VALUE OF CROP PRODUCTION
ANTELOPE-MOJAVE BASIN, 1956

August 1957

	Kern County <u>Portion</u>	Los Angeles County <u>Portion</u>	San Bernardino County <u>Portion</u>	Area Total
<u>Fruits and Nuts</u>				
Almonds	\$ -	\$ 110,690	\$ -	\$ 110,690
Apples	-	39,200	96,449	135,649
Grapes	-	5,850	818	6,668
Peaches	-	291,380	14,300	305,680
Pears	-	444,850	6,000	450,850
Other	-	24,540	-	24,540
Total	-	<u>\$ 916,510</u>	<u>\$ 117,567</u>	<u>\$ 1,034,077</u>
<u>Field Crops</u>				
Alfalfa hay	\$1,651,510	\$4,927,400	\$1,701,540	\$ 8,280,450
Alfalfa seed	971,300	830,300	120,500	1,922,100
Irrigated pasture	21,489	400,000	243,500	664,989
Grain and grain hay	823,815	1,356,640	175,150	2,355,605
Miscellaneous	598,466	545,540	241,565	1,385,571
Total	<u>\$4,066,580</u>	<u>\$8,059,880</u>	<u>\$2,482,255</u>	<u>\$14,608,715</u>
<u>Vegetables</u>				
Cantaloupe	\$ -	\$ 144,850	\$ -	\$ 144,850
Watermelon	-	4,500	-	4,500
Onions	558,900	65,630	253,000	877,530
Potatoes	55,793	237,600	-	293,393
Miscellaneous	-	27,600	480	28,080
Total	<u>\$ 614,693</u>	<u>\$ 480,180</u>	<u>\$ 253,480</u>	<u>\$ 1,348,353</u>
Total All Crops	<u>\$4,681,273</u>	<u>\$9,456,570</u>	<u>\$2,853,302</u>	<u>\$16,991,145</u>

Source: Computed from annual reports of the Agricultural Commissioner's Offices of Kern, Los Angeles, and San Bernardino Counties.

TABLE 15

AGRICULTURAL LAND USE
KERN COUNTY PORTION OF
ANTELOPE-MOJAVE BASIN
(in Acres)

August 1957

	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
<u>Field Crops</u>				
Alfalfa hay	7, 129	5, 576	6, 553	7, 185
Alfalfa seed	220	1, 027	2, 729	6, 450
Irrigated pasture	-	335	215	184
Grain and grain hay	10, 230	16, 418	16, 829	18, 285
Miscellaneous	<u>5, 487</u>	<u>4, 207</u>	<u>3, 391</u>	<u>2, 874</u>
Total Field Crops	<u>23, 066</u>	<u>27, 563</u>	<u>29, 717</u>	<u>34, 978</u>
<u>Vegetables</u>				
Onions	-	140	143	345
Potatoes	-	140	140	63
Miscellaneous	-	<u>80</u>	<u>64</u>	<u>-</u>
Total	-	<u>360</u>	<u>347</u>	<u>408</u>
Total All Crops	<u>23, 066</u>	<u>27, 923</u>	<u>30, 064</u>	<u>35, 386</u>
Irrigated Crops	17, 331	17, 943	17, 834	23, 732
Nonirrigated Crops	5, 735	9, 980	12, 230	11, 654
Fallow	<u>2, 900</u>	<u>3, 460</u>	<u>9, 300</u>	<u>6, 000</u>
Total Cropland	<u>25, 966</u>	<u>31, 383</u>	<u>39, 364</u>	<u>41, 386</u>

Source: Computed from annual reports and information supplied by Kern County Agricultural Commissioner's Office.

period, irrigated cropland increased from 17,331 to 23,732 acres. This expansion has come principally in alfalfa seed and grain crops.

Even though the high desert area is not generally considered good cotton country because of detrimental climatic conditions, there have been several thousands acres grown near Cantil in each of the last several years. Erratic yields have been reported varying from one-quarter to one and one-half bales per acre. Yields of most other crops grown in this area are good to excellent compared to other agricultural areas.

2. Los Angeles County

The character of agricultural production in the Los Angeles County portion of the Antelope-Mojave area has shown remarkable stability during the past 10 years. Each of the three major crop groups - fruits and nuts, field crops, and vegetable crops - accounted for the same proportion of total acreage in 1956 as they did in both 1945 and 1950. Though total cropland and cropping patterns have changed little, irrigated acreage has increased from 48,239 in 1950 to 60,483 in 1956, as indicated in Table 16, following this page.

The cropping pattern of this area is based firmly upon the production of feed and forage crops as indicated in Table 17, also following this page. Over 88% of total crop acres are devoted to alfalfa and grain production. Except for a gradual decrease in fruit and nut acreage and an increase in miscellaneous field crops, there has been little change in cropping patterns over recent years.

Fruit and nut production is concentrated along the foothills in the southern end of the area from Valyermo to Quartz Hill. About one-half of these orchards are irrigated. The large acreages devoted to dry land grain farming are almost entirely concentrated in the area to the west of Lancaster. Alfalfa production, as well as the production of other field and vegetable crops, occupies large areas to the east and west of Lancaster.

Much of the fruit produced in the area is sold at roadside and commands relatively good prices. Large quantities are also shipped to the Los Angeles market where the high quality of the fruit, particularly peaches, brings good market prices. Much of the grain produced in the area is marketed locally to

TABLE 16

AGRICULTURAL LAND USE
LOS ANGELES COUNTY PORTION OF
ANTELOPE-MOJAVE BASIN
(in Acres)
August 1957

	<u>1945</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
<u>IRRIGATED CROPS</u>								
Fruits and Nuts	1,530	1,633	1,630	1,562	1,562	1,531	1,473	1,393
Field Crops	33,900	45,862	46,791	47,720	49,970	52,951	53,820	58,340
Vegetables	475	716	915	585	770	320	460	700
Other	<u>0</u>	<u>28</u>	<u>28</u>	<u>30</u>	<u>35</u>	<u>45</u>	<u>50</u>	<u>50</u>
Total Irrigated	<u>35,905</u>	<u>48,239</u>	<u>49,364</u>	<u>49,897</u>	<u>52,337</u>	<u>54,847</u>	<u>55,803</u>	<u>60,483</u>
<u>NONIRRIGATED CROPS</u>								
Fruits and Nuts	1,065	1,735	1,705	1,613	1,560	1,522	1,496	1,475
Field Crops	<u>43,700</u>	<u>45,160</u>	<u>1,650</u>	<u>47,300</u>	<u>44,290</u>	<u>43,475</u>	<u>39,750</u>	<u>38,000</u>
Total Nonirrigated	<u>44,765</u>	<u>46,895</u>	<u>3,355</u>	<u>48,913</u>	<u>45,850</u>	<u>44,997</u>	<u>41,246</u>	<u>39,475</u>
FALLOW	40,000	45,000	88,000	42,200	45,000	44,000	40,000	39,550*
Total Cropland	<u>120,670</u>	<u>140,134</u>	<u>140,719</u>	<u>141,010</u>	<u>143,187</u>	<u>143,844</u>	<u>137,049</u>	<u>139,508</u>

*Includes approximately 1,550 acres placed under the acreage reserve program.

Source: Computed from annual reports and information supplied by Los Angeles County Agricultural Commissioner's Office.

TABLE 17

CROP ACREAGES
LOS ANGELES COUNTY PORTION OF
ANTELOPE-MOJAVE BASIN
(in Acres)

August 1957

	<u>1945</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
<u>Fruits and Nuts</u>								
Almonds	1,050	1,743	1,740	1,740	1,725	1,710	1,700	1,700
Apples	200	230	230	158	140	140	125	110
Grapes	200	182	160	145	130	112	96	80
Peaches	290	412	450	480	517	518	518	518
Pears	630	552	520	447	420	395	360	300
Other	<u>225</u>	<u>249</u>	<u>235</u>	<u>205</u>	<u>190</u>	<u>178</u>	<u>170</u>	<u>160</u>
Total	<u>2,595</u>	<u>3,368</u>	<u>3,335</u>	<u>3,175</u>	<u>3,122</u>	<u>3,053</u>	<u>2,969</u>	<u>2,868</u>
<u>Field Crops</u>								
Alfalfa hay	28,500	34,200	34,900	36,000	36,400	33,200	34,800	35,900
Alfalfa seed	2,100	325	445	950	1,900	1,720	1,990	2,040
Irrigated pasture	-	2,720	3,890	4,100	4,300	4,400	4,060	4,000
Grain and grain hay	46,900	52,136	7,345	52,590	49,330	49,560	48,210	50,210
Miscellaneous	<u>100</u>	<u>1,641</u>	<u>1,861</u>	<u>1,380</u>	<u>2,330</u>	<u>7,546</u>	<u>4,510</u>	<u>4,190</u>
Total	<u>77,600</u>	<u>91,022</u>	<u>48,441</u>	<u>95,020</u>	<u>94,260</u>	<u>96,426</u>	<u>93,570</u>	<u>96,340</u>
<u>Vegetables</u>								
Cantaloupe	200	445	675	460	470	290	250	180
Watermelon	70	65	120	50	90	30	40	15
Onions	-	120	90	-	30	-	-	70
Potatoes	165	60	-	-	130	-	120	400
Miscellaneous	<u>40</u>	<u>54</u>	<u>58</u>	<u>105</u>	<u>85</u>	<u>45</u>	<u>100</u>	<u>85</u>
Total	<u>475</u>	<u>744</u>	<u>943</u>	<u>615</u>	<u>805</u>	<u>365</u>	<u>510</u>	<u>750</u>
Total All Crops	<u>80,670</u>	<u>95,134</u>	<u>52,719</u>	<u>98,810</u>	<u>98,187</u>	<u>99,844</u>	<u>97,049</u>	<u>99,958</u>

Source: Computed from annual reports and information supplied by the Los Angeles County Agricultural Commissioner's Office.

mills producing poultry feed. The remainder of the feed and forage crops including most of the hay is shipped across the mountains into the Los Angeles metropolitan area. The good quality hay produced in the area finds a ready market in the concentrated dairy-producing areas of Southern California.

The erratic nature of vegetable production in the area is also reflected in the statistics in Table 17. The acreages shown have usually been concentrated in the hands of a few growers who have had experience in producing vegetables. Though cantaloupe production has been the most consistent, acreages have decreased in recent years. Several potato producers have obtained good yields the last few years and acreages are increasing.

3. San Bernardino County

Agricultural production in the San Bernardino County section is also primarily based upon the production of feed and forage crops, though there have been a few minor changes in cropping patterns in recent years. The predominance of alfalfa, grains, and pasture is indicated in Table 18, following this page. Over 86% of total cropland is devoted to the production of these crops. The relatively small production of apples in the area has gradually decreased. Vegetable production, which in 1950 accounted for 10% of total cropland, has also decreased very rapidly. Production was concentrated in the hands of a few growers who have since left the area.

The bulk of the acreage is concentrated along the Mojave River all the way from the mountains in the south out to Newberry in the east. There is also a sizable acreage in the vicinity of Hinkley to the west of Barstow and other acreage near Harper Lake.

(3) Current Livestock Production

Livestock production is actually more important in terms of dollar output than crop production. The value of livestock output in 1956 was \$27.1 million compared with \$17.0 million for all crop production. Even though poultry contributes over 80% of returns

TABLE 18

AGRICULTURAL LAND USE
SAN BERNARDINO COUNTY PORTION OF
ANTELOPE-MOJAVE BASIN
(in Acres)

August 1957

	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
<u>Fruits and Nuts</u>							
Almonds	1	1	1	1	1	1	-
Apples	280	280	250	250	250	250	133
Grapes	40	40	30	40	40	40	12
Peaches	38	38	38	38	38	38	10
Pears	23	20	20	20	20	20	12
Other	<u>9</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>1</u>	<u>1</u>	<u>-</u>
Total	<u>391</u>	<u>383</u>	<u>343</u>	<u>353</u>	<u>350</u>	<u>350</u>	<u>167</u>
<u>Field Crops</u>							
Alfalfa hay	11,000	13,067	13,814	12,875	12,400	13,236	12,604
Alfalfa seed	500	500	1,000	800	1,120	1,146	980
Irrigated pasture	1,800	1,800	1,750	2,100	2,462	2,092	2,355
Grain and grain hay	2,000	2,100	2,200	2,600	3,070	3,043	1,428
Miscellaneous	<u>544</u>	<u>1,171</u>	<u>757</u>	<u>1,087</u>	<u>970</u>	<u>2,287</u>	<u>2,281</u>
Total	15,844	18,638	19,521	19,462	20,022	21,804	19,648
<u>Vegetables</u>							
Cantaloupe	35	125	135	20	-	-	-
Watermelon	30	10	125	5	-	-	-
Onions	140	120	120	110	90	160	230
Potatoes	1,600	1,135	1,540	1,100	500	-	-
Other	<u>35</u>	<u>108</u>	<u>120</u>	<u>48</u>	<u>55</u>	<u>-</u>	<u>8</u>
Total	<u>1,840</u>	1,498	<u>2,040</u>	<u>1,283</u>	<u>645</u>	<u>160</u>	<u>238</u>
Total All Crops*	<u>18,075</u>	<u>20,519</u>	<u>21,904</u>	<u>21,098</u>	<u>21,017</u>	<u>22,314</u>	<u>20,053</u>

*Since all crops are irrigated, this figure also represents total irrigated acres and total cropland.

Source: Computed from annual reports and information supplied by San Bernardino County Agricultural Commissioner's Office.

from livestock production it should be noted that sheep, dairy cattle, and beef cattle each contribute over \$1 million as reflected in Table 19, following this page.

The production of milk at present is limited, with most supplies being imported. Of the less than 20 commercial dairy herds in the entire area, most are in the San Bernardino County portion where sales are largely to a single processor. Operations are typically of the dry lot type with hay purchased locally and concentrates brought in from south of the mountains.

A few beef cattle breeding herds are scattered throughout the basin area. Feed in the desert and mountains is extremely variable and limited. Supplemental feeding on irrigated pastures is customary.

The feed lot finishing of cattle has shown relatively little change in recent years. In the Lancaster area there are about a half-dozen large-scale feed lots; in addition, there are several small farmer-feeders who finished their own cattle. It is estimated that there were approximately 31,000 head of cattle finished in feed lots last year.

At certain times of the year one may see thousands of head of sheep in the Kern and Los Angeles County sections of the area. Estimates have run all the way from 50,000 to 100,000 head. Many of the bands are headquartered in Antelope Valley where the owners

TABLE 19

VALUE OF LIVESTOCK PRODUCTION
ANTELOPE-MOJAVE BASIN, 1956

August 1957

	Kern County <u>Portion</u>	Los Angeles County <u>Portion</u>	San Bernardino County <u>Portion</u>	Area <u>Total</u>
<u>Dairy Cattle</u>	\$ -	\$ 291, 100	\$1, 190, 900	\$ 1, 482, 000
<u>Beef Cattle</u>				
Range	456, 800	608, 000	146, 600	1, 211, 400
Feed Lot	-	834, 750	211, 560	1, 046, 310
<u>Sheep</u>				
Lambs	476, 000	522, 000	21, 375	1, 019, 375
Wool	170, 100	135, 800	-	305, 900
<u>Hogs</u>	22, 000	14, 700	84, 800	121, 500
<u>Poultry</u>				
Eggs	86, 400	1, 440, 000	313, 920	1, 840, 320
Fryers	136, 000	9, 922, 500	4, 263, 900	14, 322, 400
Turkeys	<u>26, 800</u>	<u>4, 240, 000</u>	<u>1, 488, 800</u>	<u>5, 755, 600</u>
 Total	 <u>\$1, 374, 100</u>	 <u>\$18, 008, 850</u>	 <u>\$7, 721, 855</u>	 <u>\$27, 104, 805</u>

Source: Computed from annual reports and information supplied by Agricultural Commissioner's Office of Kern, Los Angeles, and San Bernardino Counties.

have alfalfa acreages. Generally the bands move into the area during the fall for lambing. In the spring most of the bands then move on to the summer ranges. In addition, about 20,000 head of lambs are fattened in feed lots each year. Because alfalfa acreages and native vegetation have not provided sufficient feed for present bands, expansion in numbers has been limited.

In terms of value of production, poultry is by far the most important agricultural enterprise in the area. In 1956, the production of eggs, fryers, and turkeys brought in almost \$22 million compared with \$8.3 million from the production of alfalfa hay. Eggs have been produced in the area for many years with production primarily for the local market. Laying hen numbers in the Los Angeles County portion have been gradually increasing over the past few years. Numbers in the San Bernardino County area, however, have been decreasing.

The production of poultry meat in the area is the largest single contributor to the total agricultural economy. In 1956, the gross return from the sale of poultry meat (fryers and turkeys) far exceeded the total income produced from the sale of all crops in the area. Production in the Los Angeles County section, which last year amounted to over 13-1/2 million fryers and caponettes and 800,000 turkeys, remained at a fairly constant level through 1953. The

increase in production which began in 1954 was primarily due to the 100% financing offered by several feed mills.

Small quantities of other livestock such as hogs, rabbits, chinchilla, and goats are raised each year in the Los Angeles and San Bernardino County sections. Numbers have remained relatively small in the last few years, however, and there seems to be no evident trend to increase these livestock enterprises.

(4) Characteristics of Farms and Operators

Several factors have contributed heavily to molding the present pattern of agriculture in the survey area. For one thing the present pattern of crop production has been carried on for many years, which has tended to bring about relative stability. A large proportion of the farms are owned by the original developer of the land, and consequently are not encumbered by real estate mortgages. This, of course, means that the original investment in land and buildings was relatively low compared with present-day land values. Under such conditions, farmers are generally able to withstand periods of low prices considerably better than farmers who have purchased in recent years and are still making mortgage payments.

According to the 1954 census of agriculture, the average size farm in the Los Angeles County portion of the area is 187 acres.

This relatively large size of farm came about because of the availability of extensive tracts of land, because of the large holdings of land devoted to dry land grains, and because of the kinds of extensive field crops which are grown.

Until recently there has been little outside or speculative capital invested in agriculture in the area. Absentee-owned farms constitute a relatively small number. A few large-scale farmers from the Bakersfield area have developed land in the west end of Antelope Valley and in the area to the south of Cantil. These, plus a recent development of land just north of Edwards Air Force Base, represent the only large-scale agricultural developments in recent years.

Differences in the availability of water and extensiveness of soil types have resulted in variations with respect to types of farming operations between the Mojave and the Antelope Valley districts. Since water is most readily obtained along the Mojave River, farmers in this area settled close to the river; however, soils along the river were the most variable and parcels of uniform soil were small. As a result, farm size in this area tends to be somewhat smaller than in Antelope Valley and yields somewhat more variable.

In Antelope Valley, on the other hand, large-size investments in wells and pumps were necessary before farming could be started.

Also larger parcels of land of more uniform soil were available. As a result the valley attracted farmers with greater capital to invest and with experience in large-scale farming.

The crop farmers who settled in the area were or soon became primarily hay producers. As is true with most farmers who grow one kind or one group of crops, these farmers have found it difficult to shift to more intensive crops. Though it has been obvious to most observers as well as to many of the local farmers that hay production in recent years has become unprofitable, most farmers have been reluctant to attempt production of other field or vegetable crops. Most lacked experience and many did not have the larger amounts of capital needed to finance production. With the large amounts of hay and other feed crops available, livestock feeding could have been a profitable industry. Though some farmers have begun feeding a few cattle in recent years, the majority have been reluctant to shift from their established alfalfa routine.

(5) Profitability and Competitive Position

The competitive position of an agricultural area depends primarily upon three factors - relative yields per acre, price, and production costs. For the principal crop of the area under study, alfalfa hay, production costs are fairly comparable to other competing agricultural areas. However, because of the somewhat

shorter growing season, average yields are somewhat less than in the better hay-producing regions of Southern California. Nevertheless, quality of the hay has been judged excellent, particularly in Antelope Valley. As a result hay from this area has commanded a premium of from \$1 to \$2 per ton. Though net returns are probably somewhat lower than in the other hay-producing areas of Southern California, the production of alfalfa has been profitable in general over the years. The depressed prices of recent years, however, have meant that hay production has increasingly come to be little more than a break-even operation in Antelope Valley.

Hay quality in the Mojave River area in recent years has been declining, and sales have generally been at a discount. Yields have averaged somewhat lower than in Antelope Valley, and production has consequently been even less profitable.

Yields per acre of some of the other better adapted crops in the subject area, such as field corn, onions, and potatoes, have been excellent on the limited acreages planted to date. Production costs are generally comparable with other producing areas. Under favorable marketing conditions these crops could be competitive with other agricultural regions. However, since these crops are marketed when production is usually heaviest throughout California, prices are generally low, thus impairing net returns.

Yields of the small acreages of deciduous fruits and nuts produced in the area are in general very low compared with state averages. These low and extremely variable yields are due primarily to the damaging effects of late spring frosts. Quality of successful crops, however, has been very good, particularly of peaches and almonds. Much of the fruit is sold at roadside, which tends to bring greater returns. When yields are good, production of most of these crops can be profitable.

Of the various livestock enterprises the production of sheep is probably the most profitable at present. Milk and egg production also brings fair returns since sales are largely to local markets.

Returns from fryer and turkey production have been extremely erratic in recent years. With the increased efficiency of transportation and with modern refrigeration, fryers can be produced in the southern states which can undersell local production on Southern California markets. Like fryer producers in other areas of California, those in this area have had several years of unprofitable operations. Proximity to the Los Angeles market has not given this area any significant competitive advantage.

(6) Trends and Changing Patterns

In summary, cropping patterns in the subject area have changed little over the past 10 years. Even though many of the

present crops are unprofitable, there is little indication that farmers are inclined to try more intensive crops in an attempt to increase returns. Many farmers are able to continue earning a living from hay production primarily because they have little or no depreciation or interest expense, also because they perform much of the labor themselves. Furthermore, the opportunity for supplementary income through off-the-farm employment has meant that other marginal farm operations have been able to continue.

Where the drop in water levels would require installation of new pumps, some abandonment of acreage is taking place, and the owner is finding other work. However, though water tables are dropping, there are only a few areas in which pumping has reached uneconomic levels. In addition, the expectation of great increases in urban population has kept many farmers on their land in the hopes of future speculative profits. These various factors have operated to retard the steady and seemingly inevitable decline of farm production in the area.

2. FACTORS AFFECTING THE FUTURE OF AGRICULTURE

Preliminary to consideration of the future agricultural potential of the survey area it is necessary to analyze and evaluate the basic factors which will condition its development. Among these factors are land, climate, water, and projected demand for agricultural products.

(1) The Land Resource

The amount of potentially irrigable land in the investigational area is exceptionally large. As indicated earlier the Department of Water Resources classified over 2.1 million acres as irrigable.* Subtracting the land now irrigated plus an allowance for farmsteads, roads, cropping practices, etc., still leaves over 1.7 million additional acres physically capable of being developed for irrigation agriculture.

1. Soil Types and Limiting Characteristics

Soils of the entire area have been transported by water from the surrounding foothills and mountains to their present position. The older of these alluvial soils are found in the central portions of the survey area and on the alluvial plains. Generally they have undergone considerable change in physical characteristics since they were deposited. The recent alluvial soils consist of unaltered deposits and are found along streams or on the upper alluvial plains.

Nearly all the soils are of coarse, sandy texture and have low water-holding capacity. Generally they are high in lime and very low in organic matter content. Almost all the soil series are of the sand or sandy loam classification. In areas of poor drainage or high water table and in areas bordering the many dry lakes, soluble salts have accumulated, resulting in alkali conditions.

The extensiveness of soil types frequently is an important factor in the character of agricultural development. Areas having large acreages of uniform soil types tend to attract farmers with large amounts of capital and greater experience in

*Standards used for the determination of irrigability will be found in Bulletin 2, "Water Utilization and Requirements of California," State Department of Water Resources, June 1955, pp. 45-47.

large-scale commercial agriculture. Where soils are more variable, farming units tend to be smaller. In the areas along the Mojave River, for instance, the soils are quite variable and cut up. This means that it may be more difficult to put together an economic farming unit than in Antelope Valley where more extensive areas of uniform soil are available.

The only limiting characteristic of importance to agricultural production in the area is the coarse texture of most of the soils. This requires particular attention to soil and water management. It also tends to limit adaptable crops to those which can be grown on the sandier soils. However, the good to excellent yields of adaptable crops which have been obtained in the area attest to the fact that under good management and with adequate water these soils can be as productive as almost any other soils in the state.

Crops in the area generally require more water than in areas with finer textured soils. In addition, the necessity for more frequent irrigations can increase irrigation labor costs and might require use of sprinklers. Where water costs per acre-foot are relatively high, as would be probable with Feather River water, these requirements clearly decrease profit potential.

2. Competition from Nonagricultural Uses

Like most other agricultural regions of California, the Antelope-Mojave area has felt the effect of competition for land from nonagricultural users for some years. Despite the large acreages of irrigable land available, almost every sale of farm land in Antelope Valley in recent years has been at a price considerably above the productive value of the land. Competition for land is reflected not only in its cost but in zoning restrictions and taxes imposed by government agencies. The restrictive effect of both of these factors on agricultural production will increase markedly in future years.

Competition from urban and industrial users as well as from speculative buyers will tend to keep an upward pressure on the price of land, even in areas far removed from present urban centers. This pressure will be intensified should formal announcement be made of intention to import Feather River water, and it will increase as the date for delivery of such water nears.

Though the districts of heaviest projected population increase (along the southern tier of the basin) are areas with large proportions of irrigable land, it is unlikely that even extraordinary urban and industrial expansion will use up all available irrigable land. Proximity of large urban areas, however, will act as a deterrent to most types of livestock operations.

(2) Climatic Conditions

Climate, more than any other factor, has influenced the cropping pattern which has developed in this desert area. The low and variable rainfall has precluded dry land farming except in the south and west portions of Antelope Valley. In addition, farmers must use greater amounts of applied water than in areas where a portion of the water requirement can be obtained from precipitation. This is reflected in higher production costs and makes the price of water a more critical factor.

The high elevation of the entire region and the consequent shorter growing season not only limits the kinds of crops which can be grown but also restricts production to the summer season. Furthermore, the possibility of late spring or early fall frosts increases the risks of farming. As will be brought out later, this factor places severe limitations on the competitive position of this area as against other agricultural-producing regions. Strong winds which occur generally throughout the survey area during some parts of the year are also detrimental to production of certain types of crops.

(3) Water Resources

Because of the basic assumption being made that Feather River water will be available to this region in 1970, the amount of water available from ground-water sources is a factor of influence only from the present to 1970. An examination of available data and surveys covering ground-water levels and storage capacities throughout the area indicates that present supplies will not be a limiting factor in any short-run agricultural development, if such development is warranted by other conditions.

1. Water Costs to 1970

How fast pumping levels drop and water costs increase will depend upon the rate and extent of agricultural and non-agricultural development, changes in cropping patterns, and changes in the relationship between gross water use and consumptive use. Furthermore, in the Mojave River valley area, the amount of recharge by virtue of runoff from the mountains draining into the Mojave River can directly affect water levels.

In order to determine the effect of dropping water levels on pumping costs, a rough estimate of hypothetical overdraft in Antelope Valley was made for the decade 1960 to 1969. Population projections developed in a later section of this study and acreage projections with \$25 per acre-foot water were used in the calculations.*

The increase in pumping lift from 1960 to 1969 which resulted from these determinations was 32 feet. Using Snyder's estimate of average lift for 1960 of 246 feet, the 1969 lift would then be 278 feet.

*Other basic data used are found in Ground Water in California, the Experience of Antelope Valley, by J. Herbert Snyder, University of California, Berkeley - February 1955, pp. 92-95.

Assuming the existing wells are capable of handling this increase in pumping lift, the additional feet would cost the Antelope Valley farmer about \$.35 per acre-foot based on present electrical rates. For alfalfa, the highest water-using crop, this would mean an increase in per acre cash costs of \$2.10 between 1960 and 1969. For most other field and truck crops, the increase in costs would be about half this amount. Based on these determinations, then, it is not likely that declining water levels in Antelope Valley between now and 1970 will cause sufficient increase in production costs to influence cropping patterns or total irrigated acreage in any one year.

A similar conclusion can be drawn for most of the other agricultural-producing regions in the investigational area. Records of the California Electric Power Company show that the levels of tested wells along the Mojave River have decreased on the average from one to four feet per year over the last six to eight years. This has been experienced during a period of below normal recharge from runoff. In the Hinkley and Harper Lake areas, the level of some wells tested has been dropping at an average rate of from 3 to 10 feet per year. In the Cantil area, a few wells have shown drops averaging about 10 feet per year.

If water levels continue dropping in these areas at the same rate as in recent years, the average drop to 1970 would not likely be greater than that projected for Antelope Valley, based on population and irrigated acreage projections. Since present pumping levels now average considerably higher than in Antelope Valley, the increase in pumping costs per acre-foot would be less.

Based on these determinations, it is unlikely that the drop in water table levels which will occur from now until 1970 throughout most of the basin area will be large enough in itself to bring about significant changes in cropping patterns and output.

2. Water Prices after 1970

As stated earlier, a basic assumption is that Feather River water would be available by 1970. For purposes of this study, the Department of Water Resources has set up two cost figures, a minimum price of \$25 per acre-foot and a maximum price of \$50 per acre-foot for irrigation. These assumed prices represent the range in cost to the farmer for Feather River water delivered to his head gate.

A further assumption has been made for purposes of this analysis - that all agricultural users of water beginning in 1970 would pay the same price per acre-foot whether they used Feather River water or pumped ground water. This assumption is based upon the premise of a public policy that will not allow some users to pay the lower cost of pumped water and to benefit from recharging of the ground-water basin, while other users in the same region are forced to pay the full cost of imported water. This is an area of public policy in which many alternatives will undoubtedly be considered to determine whether equalization of water costs or some form of subsidization will govern. The assumption of \$25 to \$50 water for all, however, is necessary to the formulation of the quantitative projections in this report.

(4) Long-Run Demand for Agricultural Products

The prospects of an increasing consumer demand for farm products which can be produced in the Antelope-Mojave area are favorable. An indication of the direction which the demand for farm products may take in the future is to be found in a recently published study of the United States Department of Agriculture.* Taking into account projected increases in population and per capita income and changes in consumption habits, projections were made of the output required in 1957 to meet expected demands.

For the crops adaptable to the survey area, the following increases in output over 1953 levels were projected by this study: feed grains, 35%; vegetables, 41%; potatoes, 2%. Though these

*United States Department of Agriculture, "The Long-Run Demand for Farms Products," by Rex F. Daly, Agricultural Economics Research, July 1956.

projections apply only to 1975 they are a clear indication of the direction and magnitude which future demand should take. Since projections of population for Southern California show greater rates of increase than for the United States as a whole, local demands will undoubtedly be at higher levels.

1. Marketing Facilities and Patterns

Readily available marketing facilities are a necessary requirement if an area is to become a large-scale producer of agricultural products. The proximity of the Los Angeles central markets coupled with the availability of good railroad and highway connections places this desert area in a favorable position under present circumstances.

Nearby packing and processing facilities are also necessary for the large-scale production of some fruits and vegetables. The scarcity of such facilities in the survey area at present, particularly for vegetables, could inhibit the expansion of production of some of these crops in the short run. In the long run, however, processing and packing facilities tend to be located where they are needed.

Several foreseeable trends are taking place in the marketing field which will have important implications on the future pattern of agricultural production. The first of these is the trend toward greater use of processed and prepared foods and purchased meals. These trends are leading to larger processing plants and wider application of automatic machinery. Both of these developments tend to increase the need for a large volume and a steady flow of raw farm products. The next logical step is more processor control over the production of its raw material through closely supervised contracts with farmers or through outright farm ownership.

Even more so than at present, the large retail food store will become the predominant outlet for farm produce. Chain stores and wholesaler groups of independent stores will increasingly either process their own products or contract for processing under their own private brands. As a result, market outlets for farm products in the future will be increasingly

concentrated among a smaller number of firms. In addition, the large sales volume of the average retail food store requires the continuous delivery of large volumes of produce of uniform quality.

2. Effect of Marketing Trends on Subject Area

These developments will tend to favor agricultural areas producing large, continuous volumes of uniform quality products. Such areas usually are dominated by large-scale, efficient, and well-financed farming units. The larger production areas which are often far from consuming centers thus have the greatest competitive advantage. Recent advances in refrigeration and precooling, in food and flavor preservation, and in the speed of transportation facilities also tend to reduce the advantage of producing areas close to major consuming markets.

Thus the proximity of the Antelope-Mojave area to metropolitan Los Angeles will have decreasing significance in future years. All of these trends in marketing must be recognized as having an adverse influence on the future of the Antelope-Mojave basin as a major area of agricultural production.

Having considered the general factors affecting the future of agriculture we turn to a consideration of the outlook in terms of specific production.

3. ADAPTABLE CROPS AND FEASIBILITY OF PRODUCTION

In projecting the future of agricultural development in the Antelope-Mojave area, it is first necessary to determine those crops which appear suitable to the physical setting and then determine whether production can be economically profitable based on costs, marketing factors, and other considerations.

(1) Adaptable Crops

Based strictly on the limitations imposed by the physical environment of soil and climate, it has been found that nearly all major field and vegetable crops can be grown under irrigation in the Antelope-Mojave area. Production experience to date has demonstrated that yields of most of these crops can be comparable to those in other major agricultural-producing areas.

Field crops which have been successfully grown in recent years include alfalfa hay, alfalfa seed, field corn, milo maize, barley, wheat, oats, irrigated pasture, Sudan hay and pasture, cotton, field beans, and sugar beets. In terms of yield and continual year-in, year-out production, alfalfa hay, alfalfa seed, field corn, milo, barley and wheat, and irrigated pasture have proven themselves the best adapted of the field crops.

The production of vegetable crops in recent years has included cantaloupes, watermelons, onions, sweet potatoes, Irish potatoes, squash, cucumbers for pickling, carrots, sweet corn, canning tomatoes, beets, cabbage, green onions, lettuce, and garlic. In addition, asparagus, broccoli, cauliflower, and strawberries could be grown.

Production experience with many of the above crops has not been extensive enough to supply sufficient information as to their

long-term suitability. On the basis of present knowledge, potatoes, onions, cantaloupes, watermelon, and possibly sweet corn and carrots appear to be the best-adapted vegetable crops.

Climatic conditions severely limit fruit production in this area. Because of the high altitude and late spring frosts, orchards must be located along the warm hillsides in the southern part of the area. Peaches have proven to be the best-adapted fruit crop, and nectarines and pears also do fairly well. Almonds are particularly affected by late spring frosts and require frost protection. Spring frosts plus the hot dry weather restrict production of other fruit and nut crops.

Though yields of fruit and nut crops have been low in the past because of frost damage and dry farming, increased use of irrigation water could produce more profitable yields. In addition, orchardists in increasing numbers are installing frost protection devices to inhibit or completely eliminate the danger of early spring frosts.

On the basis of physical environment alone, therefore, the choice of adaptable crops open to a farmer in the subject area is wide and varied. Previous experience with many of these crops has shown that good yields can be expected under good management practices. Which crops should be selected for future production will in the final analysis be determined primarily by economic factors.

(2) Relative Costs and Returns

Since cultural costs are generally comparable with other producing areas, the most influential economic factors are the price received for the product, the cost of land, and the cost of water. In order to determine the effect of the two levels of assumed water costs on future agricultural demand for water, estimated budgets have been drawn up for selected adaptable crops. By calculating the residual available to pay for irrigation water conclusions can be reached as to the economic feasibility of producing particular crop patterns.

1. Crops Selected for Study

The crops selected for analysis were from three major crop groupings - hay and pasture crops, field crops, and vegetable crops. At least two were analyzed from each grouping. Experience has shown that each will produce high yields in the area. Consequently, their capacity to pay for water should be at least as great as that of most other crops in their group.

An analysis of tree crops and livestock enterprises has been omitted. Fruit production at present is relatively unimportant in the subject area and there is limited acreage for increased production. Water use by livestock is relatively low and thus does not constitute a major water demand. Therefore, no budgets have been prepared for such.

2. Basis of Yield, Price, and Cost Estimates

The typical budgets for the adaptable crops selected for analysis are presented in Table 20, following this page. The basis for the various estimates are discussed in the following paragraphs.

TABLE 20

TYPICAL BUDGETS AND CAPACITY
TO PAY FOR SELECTED CROPS
ANTELOPE-MOJAVE BASIN

August 1957

	<u>Alfalfa Hay</u>	<u>Irrig- ated Pasture</u>	<u>Alfalfa Seed</u>	<u>Field Corn</u>	<u>Milo</u>	<u>Irrig- ated Wheat</u>	<u>Canta- loupe</u>	<u>Carrots</u>	<u>Onions</u>	<u>Pota- toes</u>
Irrigation water require- ment (in feet)	6.0	6.0	3.5	3.5	2.75	2.0	3.0	3.0	3.0	3.5
Yield per acre	6 T	800 lb. gain	700 lbs. plus 1 T hay	3 T	45 cwt	40 cwt	200 80 lb. crates	300 6 doz. crates	900 50 lb. sacks	275 cwt
Returns per unit	\$ 26.50	\$.18	\$.30	\$ 65.00	\$ 2.75	\$ 3.50	\$ 3.00	\$ 3.20	\$.120	\$ 2.50
Total returns per acre	<u>\$159.00</u>	<u>\$144.00</u>	<u>\$236.50</u>	<u>\$195.00</u>	<u>\$123.75</u>	<u>\$140.00</u>	<u>\$600.00</u>	<u>\$960.00</u>	<u>\$1,080.00</u>	<u>\$687.50</u>
Cost of production per acre										
Cash costs excluding water*	\$ 74.00	\$ 40.00	\$108.00	\$ 82.00	\$ 46.00	\$ 52.00	\$431.00	\$790.00	\$ 822.00	\$440.00
Noncash costs**	<u>43.50</u>	<u>43.00</u>	<u>41.00</u>	<u>36.00</u>	<u>36.00</u>	<u>35.00</u>	<u>46.00</u>	<u>53.00</u>	<u>46.00</u>	<u>48.00</u>
Total costs except water	<u>\$117.50</u>	<u>\$ 83.00</u>	<u>\$149.00</u>	<u>\$118.00</u>	<u>\$ 82.00</u>	<u>\$ 87.00</u>	<u>\$477.00</u>	<u>\$843.00</u>	<u>\$ 868.00</u>	<u>\$488.00</u>
Residual for manage- ment and water per acre	\$ 41.50	\$ 61.00	\$ 87.50	\$ 77.00	\$ 41.75	\$ 53.00	\$123.00	\$117.00	\$ 212.00	\$199.50
Residual per acre-foot of water required	\$ 6.92	\$ 10.17	\$ 25.00	\$ 22.00	\$ 15.18	\$ 26.50	\$ 41.00	\$ 39.00	\$ 70.67	\$ 57.00

*Excludes cash costs of pumping.

**Excludes interests on investment and depreciation on well and pump.

The estimates of yield per acre are based on production experience in the area to date. They represent yields which should be expected under good management, with water application at the rate shown, and with cultural practices consistent with the cost estimates.

As stated earlier, all projections in this survey assume that present cost-price relationships will continue. Because agricultural prices and costs often fluctuate widely from year to year, the average of the years 1952-1956 was chosen as most representative of current relationships.

Estimates of the price received per unit are based upon average prices received from 1952 through 1956 by growers in the investigational area. Sources of these data include the Agriculture Commissioner's offices of Kern, Los Angeles, and San Bernardino Counties, the University of California Agricultural Extension Service in each of the counties, and other local sources in the subject area.

Costs of production are also based upon 1952-1956 average costs and were computed from cost studies of the University of California's Agricultural Extension Service. "Cash costs excluding water" represent all labor (including the operator or unpaid family), material, and cash overhead costs, but excluding pumping costs and cash repair costs on the well. "Noncash costs" include depreciation and interest on investment for land, buildings, equipment, and irrigation distribution system, but do not include interest and depreciation on the well and pump.

3. Significance of Residual Income Estimates

It should be emphasized in studying these data that the resultant residual income which is calculated includes both that available to pay for water delivered to the farmer's head gate plus a return to the operator for his management ability. Where an operator is willing to forego a return on his management, the total residual shown represents the maximum he would be able to pay for water. Since most managers presumably are unwilling to forego a return on their ability for longer than a few years, the long-run payment capacity for water for each of the selected crops is undoubtedly considerably less than the residual shown.

The residual incomes have been reduced to a per acre-foot figure, based on the irrigation water requirement shown for each crop. These water requirements are based upon estimates of the amount of water which a farmer would need to purchase in order to produce yields of the magnitudes shown. They are based upon typical irrigation applications currently being made by average to good farmers in the area and generally represent an irrigation efficiency of about 50%.

Obviously, a change in any of the estimates of yield, price, cost, or water requirement would change the payment capacity of a given crop. Over some of these the farmer has little or no control, such as the price he pays for production items or the price received for his product. Others, such as yield per acre or irrigation water requirement, can be influenced by the application of management ability. For example, it is possible through the use of sprinklers to increase irrigation efficiency to 75%, thus reducing the total water requirement and increasing payment capacity. If this were done on alfalfa, for example, the water requirement could be reduced to four feet. Residual income, however, would be increased to only slightly over \$10 per acre-foot as against the \$6.92 reflected in Table 20.

The estimates are intended to give indications only of the general range of payment capacity per acre-foot of water. As shown in the previous example, changes of a foreseeable magnitude in any of the components used would not, therefore, seriously affect the general conclusions or projections based upon these conclusions.

(3) Capacity To Pay for Selected Crops

The foregoing budget analysis of costs and returns clearly reveals that alfalfa hay and pasture and field crops cannot afford to pay even the minimum assumed price of \$25 per acre-foot for imported water. With a residual of \$6.92 per acre-foot of water required from alfalfa hay production, this crop becomes palpably uneconomic. Alfalfa seed, with an estimated residual of \$25 for

both water and management, as well as wheat with a residual of \$26.50, is so marginal that production means little or no profit for the operator if he must pay \$25 for water.

On the other hand, the estimated residuals for vegetables, ranging from \$39 for carrots to \$70.67 for onions, make these crops economically feasible with \$25 water. Since climatic conditions limit the possibilities for expansion of fruit and nut crops, it is concluded that under the assumptions stated the future of crop agriculture in the area depends entirely upon the production of vegetables with \$25 water.

Should imported water prices be fixed at the assumed maximum price of \$50 it is unlikely that any crop production would be economically feasible. Some vegetable crops could afford this high-priced water, but management returns would be low, risks involved would be great, capital requirements per acre for operating costs would be high, and consistently good management practices would be required. These limitations would preclude any appreciable production over the long run.

4. COMPETITIVE AGRICULTURAL POSITION OF THE ANTELOPE-MOJAVE AREA

In the final analysis, the future for the agricultural development of this area will depend on its competitive position with other agricultural

districts of the state. At first glance it appears that the subject area has many advantages as an important future agricultural center. Large quantities of fair to good quality land are available, much of it in large blocks. It has adequate transportation facilities and most of the potentially irrigable lands are easily accessible. Though some crops cannot be grown, its list of adaptable crops is long and varied. Proximity to the Los Angeles metropolitan area provides producers with a ready market for their agricultural products. The gradual elimination of other Southern California agricultural-producing areas should mean not only fewer local agricultural products being placed on local markets but should also provide a large supply of experienced farmers who must relocate to other agricultural areas. These favorable circumstances, however, represent only part of the picture. Other factors as discussed below definitely limit the possibilities.

As indicated in the previous section, the competitive position of the Antelope-Mojave area as an irrigated agricultural region must be based largely on the feasibility and profitability of vegetable production. The availability of hundreds of thousands of acres of potential agricultural land for this purpose is of limited advantage. At the same time that water would be available from the Feather River Project to the subject area, it would also be available to over a half-million acres of potentially irrigable land on the west side of San Joaquin Valley. Even were there no new lands available for development in competing areas of agricultural production,

large acreages currently devoted to the production of field and forage crops could be shifted to vegetable production. This means that millions of acres of land in other areas would offer competition to the Antelope-Mojave basin.

Soil and climatic conditions of the survey area also definitely reduce its competitive advantage. Production is limited to those crops which like a sandy soil, and the quality of the soil is limited to fair and good classifications. On the other hand, in the west side of San Joaquin Valley as well as in other producing areas of Southern California, there exist thousands of acres of soil with good and excellent ratings.

The relatively shorter growing season likewise severely limits the desirability of this desert area for vegetable production. Though the growing season is of sufficient length to produce most vegetables, late spring and early fall frosts limit production to the summer months for all but a few crops. This means that the bulk of the crops are placed on the market when prices are seasonally at their lowest. In addition, the number of crops that can be produced in a year is limited to one or at most two. Most producers of specialty vegetable crops prefer areas where from three to five crops per year can be raised.

The price of land is also an important consideration to farmers thinking of moving into an area. Land prices in the subject area have already been pushed upward by the speculative fever, and further pressure

can be expected once Feather River water is a certainty. As already stated, there is little land currently available in the area at a price based solely on its agricultural productivity. Agriculture, even for specialized vegetable production, cannot compete for land with houses and industry.

The purchase of land for speculation will undoubtedly continue to keep prices of all favorably situated irrigable land considerably above a reasonable agricultural value. In contrast, some lands are still available in the desert valleys of Southern California at close to their farm value. Since the west side of San Joaquin Valley is not expected to become urbanized or industrialized, it is probable that land in that area will also be sold at prices based largely upon agricultural productivity. High land costs, zoning restrictions, and increasing taxes will act as a deterrent to extensive development of vegetable production in the subject area.

In terms of water costs, other competing areas of agricultural production have a decided advantage. The per acre water cost for many vegetables grown in the desert valleys of Southern California would be from one-half to one-tenth the cost for the Antelope-Mojave area, based on the minimum assumed rate of \$25. Even for the potential irrigable land on the west side of San Joaquin Valley, water costs would be about one-half those in the subject area, based on an estimate from a study made for the state legislature.

Community attitudes will not directly influence the relative profitability of farming in any given area, but they can markedly affect the rate and extent of agricultural development. Most leaders in the Antelope-Mojave area, including many agricultural leaders, seem to feel that farming must soon give way to urban and industrial growth. Such attitudes can influence the thinking of agricultural capital and managerial ability looking for a place to locate.

In summary, therefore, compared with other producing areas the future competitive position of the Antelope-Mojave area does not appear favorable. At the minimum assumed rate of \$25 per acre-foot, crop production is limited to vegetables. Even though vegetables could be profitably produced with that minimum water cost, the limitations on kinds of crops, time of marketing, and number of crops raised per year are definite disadvantages. In addition, prospective growers would be faced with higher land costs and considerably greater water costs.

5. THE AGRICULTURAL OUTLOOK

The dominant factor affecting the agriculture of the Antelope-Mojave area between the present and 1970 will be the expectation of Feather River water at that date and the price fixed for such. It is true that some farmers may choose to ignore the new water supply, even at the assumed minimum price of \$25, expecting to carry on farm operations indefinitely with their somewhat lower costs of pumping the underground supply. As indicated

earlier, however, for purposes of these projections it is assumed that this possible difference in water costs after 1970 will be essentially closed by public policy. Therefore, all farmers pertinent to our survey are assumed to be paying import water prices after 1970 regardless of source of supply. In any case, those who might continue farming with ground-water supplies would have little effect on import water demand.

(1) Speculative Purchase of Farm Land

Once an authoritative decision concerning imported water has been made favorable to the subject area, as assumed, the demand for land will take on a speculative nature considerably greater than exists at present. Because the per acre-foot water cost (either \$25 or \$50) will preclude profitable production of most agricultural crops, speculative buying will be based upon eventual use of the land for urban or industrial expansion. Under these circumstances farmers will likely be under increasing pressure to sell their land, particularly those close to present urban areas.

The stimulation to agricultural growth which usually accompanies the expectation of an adequate water supply would be countered in this area by its relatively high cost. Certainly, there would be few commercial farmers who would come into the area during this period with the expectation of making profitable long-term returns from agriculture (even in anticipation of the minimum price of \$25

for imported water). Those who might come in would essentially be land speculators. Even with the possibility of speculative profits from the land after 1970, profit possibilities until 1970 are not attractive enough to induce appreciable capital investments for agricultural purposes in the area.

Farmers now in the area will have several alternate courses of action open during the next decade. First, they can decide to sell out at subdivision prices; or they can defer this step, hanging on to their present production with pump irrigation for some years ahead. Second, they may decide to stay in farming and shift to the few intensive crops which can afford the higher cost of water. How many farmers will be able to sell out prior to 1970 will depend upon their location, their willingness to hold their property for larger speculative profits, and their inclination to shift to more intensive types of crops.

Since it is unlikely that vegetable farmers from locations outside the subject area will enter into production between now and 1970, any shift to the more intensive vegetable or specialty crops would have to come on the part of farmers now located in the area. Under the most favorable circumstances this could not mean appreciably more acreage placed under production than at present. In fact, it is believed that agricultural production will generally decline in the

light of all factors and circumstances applying between now and the time of potential water deliveries.

(2) Prospects for Vegetable Production

Based on the typical budgets and estimated capacity to pay for water imports previously discussed, it appears that the future for large-scale agriculture in the area becomes essentially a question of its competitive advantage as a vegetable production area in relation to other major agricultural regions in the state. Present cost-price relationships indicate that production of such crops as potatoes, onions, cantaloupes, and carrots could be profitable with \$25 water.

As brought out in the previous section, physical and economic conditions greatly reduce profit expectations and would effectively prevent expansion in vegetable production from new growers coming into the area. Vegetable production would thus have to come principally from those farmers already in the area.

While some local growers may be expected to shift to vegetables, under the circumstances it is difficult to forecast any major development for vegetable production in the area. The increases forecast up to 1970 with \$25 water (see Table 21, following this page) would come principally from growers intending to continue farming for some years. After 1970 the projected acreage of

TABLE 21

PROJECTED PATTERN OF IRRIGATED CROPS
ANTELOPE-MOJAVE BASIN

At Assumed Water Cost of \$25 per Acre-Foot
(in Acres)

August 1957

		<u>1956</u>	<u>1960</u>	<u>1969</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Fruits and Nuts	Kern	-	-	-	-	-	-	-	-	-
	L. A.	1,393	1,250	900	800	500	200	-	-	-
	S. B.	167	100	-	-	-	-	-	-	-
	Total	<u>1,560</u>	<u>1,350</u>	<u>900</u>	<u>800</u>	<u>500</u>	<u>200</u>	<u>-</u>	<u>-</u>	<u>-</u>
Alfalfa <u>1/</u>	Kern	13,635	14,000	4,000	2,000	-	-	-	-	-
	L. A.	37,940	35,000	10,000	2,000	-	-	-	-	-
	S. B.	13,584	11,000	1,000	-	-	-	-	-	-
	Total	<u>65,159</u>	<u>60,000</u>	<u>15,000</u>	<u>4,000</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Pasture	Kern	184	100	-	-	-	-	-	-	-
	L. A.	4,000	4,000	3,000	200	200	300	400	500	600
	S. B.	2,355	2,500	500	100	100	100	200	200	200
	Total	<u>6,539</u>	<u>6,600</u>	<u>3,500</u>	<u>300</u>	<u>300</u>	<u>400</u>	<u>600</u>	<u>700</u>	<u>800</u>
Grain and Grain Hay <u>2/</u>	Kern	6,631	5,000	1,000	-	-	-	-	-	-
	L. A.	12,210	10,000	2,000	-	-	-	-	-	-
	S. B.	1,428	1,000	200	-	-	-	-	-	-
	Total	<u>20,269</u>	<u>16,000</u>	<u>3,200</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Miscellaneous Field <u>3/</u>	Kern	2,874	3,500	3,000	2,500	1,000	-	-	-	-
	L. A.	4,190	5,000	4,000	3,000	1,500	-	-	-	-
	S. B.	2,281	1,500	800	100	-	-	-	-	-
	Total	<u>9,345</u>	<u>10,000</u>	<u>7,800</u>	<u>5,600</u>	<u>2,500</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Vegetables <u>4/</u>	Kern	408	800	3,000	2,500	1,000	1,000	1,000	-	-
	L. A.	750	2,500	5,000	5,000	5,000	4,000	4,000	3,500	3,500
	S. B.	238	300	2,000	2,000	1,500	1,000	1,000	1,000	1,000
	Total	<u>1,396</u>	<u>3,600</u>	<u>10,000</u>	<u>9,500</u>	<u>7,500</u>	<u>6,000</u>	<u>6,000</u>	<u>4,500</u>	<u>4,500</u>
Total Irrigated	Kern	23,732	23,400	11,000	7,000	2,000	1,000	1,000	-	-
	L. A.	60,483	57,750	24,900	11,000	7,200	4,500	4,400	4,000	4,100
	S. B.	20,053	16,400	4,500	2,200	1,600	1,100	1,200	1,200	1,200
TOTAL AREA		<u>104,268</u>	<u>97,550</u>	<u>40,400</u>	<u>20,200</u>	<u>10,800</u>	<u>6,600</u>	<u>6,600</u>	<u>5,200</u>	<u>5,300</u>

1/ Hay and seed

2/ Barley, oats and wheat for grain, hay or seed

3/ Corn, milo, cotton, miscellaneous seeds, etc.

4/ Including specialty crops, cut flowers, and nursery stock

Note: Acreage projections are based on the premise that all users of irrigation water will pay full cost of \$25.00 per acre-foot beginning in 1970 regardless of source of water supply.

vegetables is based first upon large-scale commercial production of such crops as potatoes, onions, and melons; and second, upon the production of specialty crops for local markets. Small acreages of such crops as sweet corn, strawberries, squash, and beans could also be competitively grown for local consumption. However, this acreage with \$25 water would reach a maximum of 10,000 acres in 1969 and gradually decrease thereafter. With \$50 water it is believed no acreage would be utilized for these crops, as reflected in Table 22, following this page.

(3) The Future of Other Crops

Since alfalfa production at present is little more than a break-even operation, acreages after 1960 can be expected to decrease rather rapidly. Seed production, on the other hand, could be profitable with \$25 water, and it is expected that many growers might shift over to seed production after 1960. Production would probably continue until the farmers were able to sell out or shifted to more intensive crops. No acreage is projected for this purpose from 1980 on, however.

The production of peaches, pears, and irrigated almonds in Los Angeles County would likely continue relatively stable except for some decrease due to farm sales for subdivision. Production of these crops could be profitable with \$25 water, and it is expected

PROJECTED PATTERN OF IRRIGATED CROPS
ANTELOPE-MOJAVE BASIN

At Assumed Water Cost of \$50 per Acre-Foot
(in Acres)

August 1957

		<u>1956</u>	<u>1960</u>	<u>1969</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Fruits and Nuts	Kern	-	-	-	-	-	-	-	-	-
	L. A.	1,393	1,250	200	-	-	-	-	-	-
	S. B.	<u>167</u>	<u>100</u>	<u>-</u>	-	-	-	-	-	-
	Total	<u>1,560</u>	<u>1,350</u>	<u>200</u>	-	-	-	-	-	-
Alfalfa <u>1/</u>	Kern	13,635	14,000	3,000	-	-	-	-	-	-
	L. A.	37,940	35,000	4,000	-	-	-	-	-	-
	S. B.	<u>13,584</u>	<u>11,000</u>	<u>1,000</u>	-	-	-	-	-	-
	Total	<u>65,159</u>	<u>60,000</u>	<u>8,000</u>	-	-	-	-	-	-
Pasture	Kern	184	100	-	-	-	-	-	-	-
	L. A.	4,000	4,000	700	-	-	-	-	-	-
	S. B.	<u>2,355</u>	<u>2,500</u>	<u>300</u>	-	-	-	-	-	-
	Total	<u>6,539</u>	<u>6,600</u>	<u>1,000</u>	-	-	-	-	-	-
Grain and Grain Hay <u>2/</u>	Kern	6,631	5,000	500	-	-	-	-	-	-
	L. A.	12,210	10,000	2,000	-	-	-	-	-	-
	S. B.	<u>1,428</u>	<u>1,000</u>	<u>100</u>	-	-	-	-	-	-
	Total	<u>20,269</u>	<u>16,000</u>	<u>2,600</u>	-	-	-	-	-	-
Miscellaneous Field <u>3/</u>	Kern	2,874	3,500	1,000	-	-	-	-	-	-
	L. A.	4,190	5,000	500	-	-	-	-	-	-
	S. B.	<u>2,281</u>	<u>1,500</u>	<u>100</u>	-	-	-	-	-	-
	Total	<u>9,345</u>	<u>10,000</u>	<u>1,600</u>	-	-	-	-	-	-
Vegetables <u>4/</u>	Kern	408	800	200	-	-	-	-	-	-
	L. A.	750	2,500	500	-	-	-	-	-	-
	S. B.	<u>238</u>	<u>300</u>	<u>100</u>	-	-	-	-	-	-
	Total	<u>1,396</u>	<u>3,600</u>	<u>800</u>	-	-	-	-	-	-
Total Irrigated	Kern	23,732	23,400	4,700	-	-	-	-	-	-
	L. A.	60,483	57,750	7,900	-	-	-	-	-	-
	S. B.	<u>20,053</u>	<u>16,400</u>	<u>1,600</u>	-	-	-	-	-	-
TOTAL AREA		<u>104,268</u>	<u>97,550</u>	<u>14,200</u>	-	-	-	-	-	-

1/ Hay and seed

2/ Barley, oats and wheat for grain, hay or seed

3/ Corn, milo, cotton, miscellaneous seeds, etc.

4/ Including specialty crops, cut flowers, and nursery stock

Note: Acreage projections are based on the premise that all users of irrigation water will pay full cost of \$50.00 per acre-foot beginning in 1970 regardless of source of water supply.

that many of the better growers may expect to continue production for some time after 1970. Since the production of the other deciduous fruits is relatively unprofitable even at present, it is expected that acreages of these fruits will decrease rapidly in both Los Angeles and San Bernardino Counties.

Many growers too far from urban developments to sell out during the next 10 to 12 years could profitably shift to the production of lower water-using field crops. Though the estimated budgets for most of these crops show that they would do little better than break even, many farmers could carry on for some years with \$25 water. These would be operators who did much of the required labor and who could forego interest and depreciation charges. On this basis then it is likely that many growers who must wait for urban development to reach them could continue making a living from field crop production after 1970. Acreages involved, however, would be small and would have little effect on water demand.

(4) Irrigated Pasture

The high water requirement for irrigated pasture precludes significant acreages even with \$25 water. The small acreages projected after 1970 are expected to be used for pasturing horses and dairy cattle. The number of pleasure horses has increased markedly

in recent years, particularly in Los Angeles County. Population increases will bring an increase in numbers of horses and consequently in pasture requirements.

The expected gradual increase in dairying would be accompanied by some use of irrigated pastures for dry cows and replacement heifers if water were priced at \$25. It would not, however, be profitable for dairymen to use irrigated pastures as a source of feed for their dairy herds.

(5) The Future of Livestock Production

The development of a permanent livestock industry is dependent upon the availability of cheap feed. Based upon the projected crop acreages, feeds inexpensive enough to support a profitable beef cattle, sheep, or hog industry are not likely to be produced in the Antelope-Mojave area. The few breeding herds now in the area should soon disappear.

Though there are several feed lots in the area at present, it is unlikely that these can remain in operation once their principal source of feed has disappeared. The area has no particular advantages for commercial feed lot operations other than proximity to the Los Angeles market. This advantage, however, would be more than offset by the necessity of having to ship in all necessary feed. Sheep

and hog raising in the area are likewise improbable because of the projected lack of necessary feeds.

(6) Prospects for Dairying

It is probable that dairying in the area will show a gradual increase based upon the area's increase in population. These dairies would typically be of the corral type with all feeds purchased from outside. As population expands, it is likely that one or two creameries would install plants in the area to process for local consumption.

In addition to the probability of some expansion in dairying to supply the expanding local market, there is also the much-discussed possibility of this area becoming the principal milk-producing region for the great Los Angeles market. Several facts are pertinent to the proper analysis of this possibility. First, the bulk of the relocation necessitated by past population pressures has already been made - primarily to the Dairy Valley area in the southern part of Los Angeles County and to the Chino Valley area along the eastern boundary of the county. Present thinking is that the dairy industry is secure in these two locations for at least the next 10 to 15 years. Second, if population pressures force another wholesale move of the dairy industry serving the Los Angeles area, it is likely that the dairymen will favor areas other than Antelope-Mojave. Areas suggested as

being more favorable are the Ventura area, San Joaquin Valley, the coastal area south of Los Angeles, or the Hemet-San Jacinto area of Riverside County. Third, dairymen producing Grade A market milk can pay higher prices for land than the producers of all crops except some fruit crops. Consequently, the fact that an area is devoted to intensive agricultural crops would not hinder the movement of the dairy industry thereto. Fourth, technological changes in both the dairy industry and in the feed industry will increasingly reduce the importance of proximity to the consuming center.

On the basis of the above considerations, it is not likely that the dairy industry supplying the Los Angeles market will move in whole or in part to the Antelope-Mojave area during the next 40 years. By the time the pressures of population might force the dairy industry out of the Ventura, south coast, Hemet-San Jacinto areas, an entirely new set of economic and technological factors may be expected to govern where the industry relocates.

(7) The Future of the Poultry Industry

The poultry industry is another one which must be constantly relocating as population expands in metropolitan areas. Unlike dairying, however, the poultry industry is already firmly established in the subject area. As regards fryer production, Antelope-Mojave has no competitive advantage. The southern areas of the United

States can undersell local producers because of increased production efficiency, improved transportation, and refrigeration. There is no reason to foresee any significant change in the relative competitive positions of the major fryer producing areas.

Nevertheless, the organization of the area's fryer industry suggests that it might be able to withstand severe competition much longer than economic facts might warrant. Since those providing the financing of the producers usually have their own mill for production of feed and a hatchery to provide chicks, they do not need to rely solely upon the sale of the birds to return them a profit. In turn, many of the operators of the fryer ranches do not rely upon that activity for their sole means of support. Many of them are wives of workers in the area or retired people. This type of operator is usually satisfied with much less return for his labor. Though there has been a rapid turnover of fryer ranches in recent years, there will undoubtedly be increasing numbers of retired people and others moving into the area who will be willing to undertake such an operation in order to supplement their income. Because of these factors and because of the low capital investment needed to get into the poultry business, it is likely that fryer production will be maintained at a relatively high level in the area for many years to come.

While the market for fryers is on a national basis, the market for egg production is on a regional basis. Consequently, the future of egg production in the subject area will be dependent upon local population growth as well as growth throughout the rest of Southern California. The fate of the present producers who are located on the fringes of the Los Angeles metropolitan area will also be of importance to future egg production in the area. Production expansion in the area sufficient to keep pace with local population growth can be expected. As with the dairymen, however, poultrymen now in the metropolitan area will probably move to San Diego, San Bernardino, or Riverside Counties rather than go directly to the desert area. This probably means that sufficient poultrymen would not move into the area to place it on an export basis until at least after 1980.

6. ESTIMATED FARM ACREAGE - 1970 TO 2020

In summary, based on the foregoing, it is clear that the Antelope-Mojave basin area cannot compete over the long run with other agricultural-producing areas in the state. Lower quality land, a shorter growing season, and higher water and land costs place this area in an unfavorable competitive position. This, it is believed, will be reflected in a progressively declining acreage devoted to agricultural production.

With Feather River water priced at the minimum of \$25 per acre-foot, it is estimated that irrigated acreage will decline from 104,268

acres in 1956 to 20,200 in 1970. Under our estimates this will drop to 6,600 by 1990 and remain relatively constant from then on. (See Table 21, following page 70). With \$50 water no irrigated acreage is projected beginning with 1970, as indicated in Table 22, following page 71. Under this maximum rate, farm production could be expected to fall off drastically in anticipation thereof during the 1960s.

It must be re-emphasized that these substantial rates of decline in predicted farm acreage are premised on the underlying assumption of uniform water costs already discussed. Thus the estimates hypothesize a situation in which all users of irrigation water will be required, beginning in 1970, to pay the full costs of imported water even though some pumping of the water table may in fact continue. Under this assumption, it is expected that a gradual decline in acreage will take place beginning in 1960 in anticipation of the higher costs to be applied in 1970. A much sharper drop-off in acreage can then be expected between 1969 and 1970 as the culmination of this adjustment. This is reflected in the foregoing tables.

It is recognized that the assumption as to universal payment of imported water costs after 1970 by all users, regardless of source of supply, may not be adopted as public policy. Thus a plan could be adopted which would permit those with existing water rights to continue to pump ground water after 1970 at rates lower than the full import water costs. This would permit such users to take advantage of the recharge

process without full payment of the differential. Under these circumstances the decline in farm acreage would tend to be more gradual over the period 1960 to 1980 than indicated in Tables 21 and 22. However, the general effect of this factor would be small, and by about 1980 farm acreages would have reached approximately the same level under either assumption. In any case these considerations in no way impair the basic conclusion that farm acreage will progressively dwindle over the next two decades as a consequence of the unfavorable competitive status of agriculture in the Antelope-Mojave area.

IV. DEFENSE ACTIVITIES AS A COMPONENT
OF ECONOMIC DEVELOPMENT

IV. DEFENSE ACTIVITIES AS A COMPONENT OF ECONOMIC DEVELOPMENT

Military installations of major size and scope are channeling large amounts of public funds into the economy of the Antelope-Mojave basin. Seven centers employ approximately 20,500 civilians and 11,200 military personnel with a gross annual payroll of \$150 million. This forms a major portion of the total income in the area.

These establishments have been largely responsible for generating and underpinning the extraordinary growth of the area in recent years. Once established, these activities have grown and attracted increasing numbers of people to the region. Because of the external character of their financial resources and their relative stability, they have imparted an element of economic strength not supplied by other sectors of the community.

The desert has been attractive to military planners for varying reasons, including remoteness with avenues of accessibility to a metropolitan area; favorable terrain features and good flying weather; low humidity with an absence of smog conditions; and the availability of electric power and other facilities. These advantages of the Antelope-Mojave area have led to the establishment of the following complex of national defense installations.

- United States Air Force Plant No. 42, at Palmdale
- Edwards Air Force Base, at Muroc
- George Air Force Base, near Victorville
- United States Naval Ordnance Test Station, at China Lake
- Marine Corps Auxiliary Air Station, at Mojave
- Marine Corps Supply Center, at Barstow
- Camp Irwin, north of Barstow

These national defense installations will continue to be of importance, particularly in the years immediately ahead, while the area is acquiring diversified economic strength. For this reason, a careful analysis is necessary to determine their probable future status and their influence on area development.

1. FACTORS AFFECTING THE FUTURE LEVEL AND CHARACTER OF DEFENSE ACTIVITIES

The level and character of defense activities in the area will be directly dependent upon the transcendent factors of international conditions, the changing technology of warfare, and the level of national defense budgets. These factors, remote as they may seem to desert development, will nevertheless directly affect the future growth of the Antelope-Mojave basin.

(1) Armed Forces and the International Climate

It is futile to attempt to predict the course of international affairs and the long-range necessity for a large military establishment

in an unstable world. Nevertheless, we must recognize that the recent success of Soviet Russia in launching earth satellites with their foreboding implications for missile warfare has hardened the international climate which conditions our national defense activities.

Therefore, from our present vantage it would appear that a strong United States military force will be both advisable and necessary over the foreseeable future even though its character, size, and weapons may change radically. Consistent with our earlier stated basic premise we have therefore assumed that international conditions will require a large military effort indefinitely.

(2) Level of Defense Expenditures

The dramatic progress of the U. S. S. R. in rocket and missile technology will have an immediate and forcible bearing on the level and character of our national defense budget. It is too early to predict administrative and legislative policies in terms of actual appropriations on these vital matters, but two trends seem to be apparent:

1. The rocket and missile program will be assigned the highest priority; both additional funds and manpower will be allocated as required to assure maximum progress. Present indications from the President and others are that these increases will be substantial and will cause a rise in the general level of defense budgets.
2. While the drive for economy in national defense expenditures, in striking evidence before Sputnik, will be modified by the increased emphasis on missiles, reductions

in outlay for conventional weapons may be of a greater magnitude and achieved more rapidly than originally planned. It appears that every attempt will be made to finance the augmented missile program to the fullest extent feasible by diversions of funds from more orthodox weapons and programs.

The repercussions of both the stepup in the missiles program and the expected cutbacks in conventional defense activities will be felt in the military installations of the area with which we are concerned.

(3) Changing Technology of Warfare

The changing technology of warfare will also be reflected in the mission and program level of the desert installations. Of particular importance is the fact that long-range military planning for some time has been predicated on the assumption that nuclear missiles will eventually replace manned aircraft to a substantial degree. Even before recent satellite developments the Air Force had alerted the aircraft industry to procurement changes over the next several years. Under the stimulus of Soviet missile progress it may be expected that this shift will now be rapidly accelerated.

There are varying opinions on the exact timing and extent to which missiles will replace manned aircraft. Based on constantly improving missile performance, the consensus of opinion before Sputnik was that these weapons would be of primary importance to

the defense of our country in about 10 to 15 years. It seems obvious now that this period must be and will be drastically shortened. At the same time, informed circles believe that there will be a need for manned aircraft for a long time. Thus, it seems clear that piloted long-range atomic bombers will remain for some time in the immediate future as our primary instrument of retaliatory destruction. Likewise jet interceptors will continue for an indeterminable period to play a primary role in our defense arsenal.

2. PRESENT STATUS AND GROWTH PROSPECTS OF MILITARY INSTALLATIONS IN THIS AREA

Inevitably, these changes and trends will affect all of the military installations in the Antelope-Mojave area, though it is anticipated that many of the establishments will be capable of conversion and adjustment to the new technology of warfare. The current status of the major defense activities in this region, and an appraisal of their short- and long-range continuation or growth prospects, is discussed in the following section. These evaluations are based on judgments expressed by informed persons both in industry and government on military expenditures and future weapons development. It must be recognized, however, that recent developments have injected an element of uncertainty in all future prognostications with respect to the magnitude and direction of particular defense activities.

(1) United States Air Force Plant No. 42, Palmdale

The facility at Palmdale was originally used by the Air Force during World War II and then sold as surplus to Los Angeles County in 1948. The county began to develop the airport as a center for the airline and aircraft industry of Southern California. The Air Force became interested in the site again in 1951 and negotiated the repurchase of the field from Los Angeles County.

Known as United States Air Force Plant No. 42, the facility occupies 4,864 acres of land and represents a capital investment by the United States Government of approximately \$45 million. This installation is under the cognizance of the Air Materiel Command. The assigned mission is to provide and maintain adequate facilities for tenant contractors engaged in the assembly of airplanes (principally jets) for delivery to the Air Force and the Navy. In addition, overhaul and storage facilities are maintained for machine tools and other industrial equipment. Overhaul work is performed under a contract with the Air Force.

Four major aircraft manufacturers at present use Plant No. 42 facilities for the assembly and testing of fighter aircraft. Tenant contractors are Convair, Lockheed, North American, and Northrop. Convair has recently moved to newly constructed quarters, and it is planned that Hughes Aircraft Company will occupy space vacated by

Convair. On July 31, 1957, some 6,400 persons were employed at the Palmdale plant. Government employees and military personnel assigned to this base total approximately 44 persons. The total annual payroll exceeds \$30 million.

Water for the plant is provided by wells located on government property, and appears adequate to meet future requirements. The principal problem is the adequacy of water for the use of employees in their homes in the surrounding area. This is supplied by the local water district from underground sources.

Ample space is available for expanding assembly facilities. Both runways were recently extended to 12,000 feet in length. To provide a buffer zone between the field and the surrounding community, a wide strip has been established in which only agricultural or industrial development will be permitted. Adequate space to test fighter aircraft, excellent flying weather, and the buffer zone around the airstrip to reduce hazards and complaints about noise are all attractive to aircraft manufacturers.

Current shifts in defense expenditures and stretch-out of aircraft delivery schedules will affect Plant No. 42. There may be temporary periods of dislocations as military schedules adjust. However, it appears that this facility has unique advantages which

should moderate such dislocations over the next few years. There are distinct prospects, under current negotiation, whereby at least one more major aircraft manufacturer would locate at the Palmdale site. However, in view of all factors bearing on the situation, no major employment increases should be anticipated in the immediate future, based on government contracts.

Over the longer range, Plant No. 42 would appear vulnerable to further shifts in defense emphasis toward the missile program. However, it is believed that this trend will tend to restrict expansion rather than cause any substantial decline. Reasonably considered, the Palmdale plant should be able to adapt itself to future adjustments in both military and civilian aircraft requirements. Thus, it is entirely feasible to assume that the restricted number of fighter planes to be assembled can be offset (1) by more complete production of military aircraft components, and (2) by commercial production and testing. Further indication of the long-range potential at Palmdale is the interest of two aircraft manufacturers in purchasing property adjacent to the airstrip.

In summary, it may be expected that this major installation will find continued utility in the long-range future and will remain as a major buttress to the economy of the area.

(2) Edwards Air Force Base

Edwards Air Force Base Flight Test Center is located at Muroc Dry Lake on the eastern edge of Antelope Valley, 100 miles northeast of Los Angeles. During World War II the base was used as a training field for P-38, B-25, and B-24 crews and for flight testing experimental and production aircraft. In 1951, Edwards became one of four centers in the newly created Air Research and Development Command.

Under its present mission, military and civilian personnel flight test the latest research and production aircraft and aircraft components. Research and development related to these tests is also carried on. Special facilities at the AFFTC include the rocket engine test laboratory, the high speed test track, the deceleration tract, the precision bombing range, an all-altitude speed course, a high precision space positioning range, and a test pilot school.

Approximately 8,800 persons are engaged in conducting the work at Edwards Air Force Base. The permanent staff includes about 3,100 civil service personnel, 2,900 contractor employees, and 2,800 military personnel. Temporary contractor personnel engaged in special or construction projects have, on occasion, augmented this total by 1,200 persons. It is estimated that the annual payroll is \$50 million for all personnel employed on the base. This

activity, which occupies approximately 300,000 acres, is the second largest Air Force installation in the United States. The capital investment in land and equipment is about \$135 million. It is anticipated that for the next several years expenditures for replacing and modernizing plant facilities will amount to about \$4 to \$5 million annually.

Water is supplied by wells located on the base. A newly constructed well is expected to alleviate shortages experienced during the dry season. The potential water supply on the north side of the base appears to be adequate to meet water requirements for the foreseeable future. At the present time authorities express little interest in Feather River water because of security and operational reasons.

As a key facility in the Air Force program of research and development, this flight test center should continue to operate at about the same or possibly at a slightly higher level of employment in the next several years. It is anticipated that present curtailments in national defense spending for conventional weapons will not seriously affect Edwards Air Force Base because of the developmental nature of its assigned mission. Such shifts in national defense budgets will likely reduce or eliminate planned expansion rather than force reductions in the existing personnel complement.

Long-range changes in warfare will inevitably result in changes in the mission of the AFFTC and some adjustments in its personnel. The center is prepared and equipped to adapt itself to new duties, including some aspects of missile development such as static testing. Being in the vanguard of new weapons development, its future as a major military installation into the indefinite future seems assured.

(3) Naval Ordnance Test Station - China Lake

Approximately 155 miles from Los Angeles in the northwestern part of the Mojave Desert is the main facility of the Naval Ordnance Test Station. This activity was established in 1943 to meet wartime needs. In 1945 it was made a permanent installation under the cognizance of the Navy Bureau of Ordnance. The assigned mission is to support this bureau by originating and analyzing new ideas in ordnance and carrying them through research, development, experimental production, test, evaluation, and pilot production. Assistance is also given in introducing new weapons to contractor production and service use.

To carry out the assigned mission, over 4,850 civilians and 1,300 military personnel are employed by N. O. T. S. The annual civilian payroll for persons working at the China Lake facility is approximately \$25 million. The main station covers about 1,200 square miles. A few miles southeast of the station is a 750

square-mile range used for aircraft, rocket, and gunnery firings and fuse testing.

Four other N. O. T. S. facilities are located in the vicinity of Pasadena. Over 650 of the 6,150 persons employed on N. O. T. S. projects work at these four installations.

Water requirements are met by wells located on the station, and the supply appears adequate for the foreseeable future. For security reasons, this activity prefers to meet its water needs from station wells.

The Naval Ordnance Test Station at China Lake is the Navy's largest ordnance research and development center. It is considered to be operating at almost optimum capacity at the present time. No significant expansion is expected to occur. At the same time there appears to be little likelihood of any substantial reduction in the activities of this station. As a key ordnance research and development center of the Navy, China Lake is playing a significant role in shaping the future technology of warfare. Therefore, this activity should be one of the last to be affected by reduced military budgets.

Both the short- and long-range pictures for N. O. T. S. indicate continued operation at approximately the same level of activity. Any additional land that might be acquired would be for test firing and would not mean sizable increases in personnel.

(4) Marine Corps Auxiliary Air Station

The Marine Corps Auxiliary Air Station at Mojave was commissioned on January 1, 1943. It was abandoned in January 1946 for approximately five years. In October 1951 it was designated as an auxiliary landing field to the Marine Corps Air Station at El Toro, and in December 1953 it was re-established as a permanent Marine Corps Auxiliary Air Station.

The mission of this installation is to provide aviation facilities in support of regular operations of the Fleet Marine Corps aircraft. Training carried on at MCAAS includes gunnery, rockets, bombing, and "carrier" practice landings. Actual firings are made over the Naval Ordnance Test Station ranges and Marine Corps ranges northeast of Mojave. Training is under the cognizance of each unit commander as Mojave MCAAS provides facilities only.

Approximately 592 persons are employed at the air station. Of this total, 179 are civilian employees and 413 are military personnel. The yearly payroll for all personnel at the station exceeds \$1,450,000. There are also 100 persons from an aircraft company holding a government contract, using the Mojave plant facilities on a space-available basis. The capital investment in land and plant equipment on this 4,800 acre installation is approximately \$10.7 million.

Water for the base is purchased from the Mojave Utility District. The district obtains water from wells located in the Tehachapi Mountains. Because the utility district has water right problems, authorities at the Marine Corps Auxiliary Air Station would like to obtain Feather River water when available.

The outcome of the proposed expansion of facilities and relocation to a site farther away from the town of Mojave is dubious as of now. Principal immediate hurdles include the problem of air space required by Edwards Air Force Base and availability of funds in what appears to be a period of contracting defense expenditures for such purposes. While the 1958 defense appropriation includes funds for the acquisition of land for this proposed relocation and expansion, the actual assignment and use of these funds for this purpose must be considered uncertain in view of new and competing budget demands.

It must also be recognized that with the shifting emphasis from planes to missiles it is possible that the ultimate need for an air station at Mojave will become highly questionable in the years ahead. This eventuality should also have considerable weight in deciding whether almost \$100 million is to be spent in relocating and expanding a present facility during the next five years only to be faced with possible abandonment in a future period.

(5) Marine Corps Supply Center

The Marine Corps Supply Center at Barstow supplies all Marine Corps activities west of the Mississippi with most requirements except for aeronautical parts, ammunition, and fresh provisions. An annex in San Francisco, under the military command of the commanding officer at Barstow, stores material not suitable to a desert climate and expedites foreign shipments.

The center carries on its operations at three locations - Nebo, Yermo, and Daggett. The three sites, which are within 11 miles of each other, occupy approximately 5,540 acres of land and represent a capital investment of over \$44,000,000. Capital expenditures over the past several years have been used to replace or modernize temporary structures built during World War II. There are 2,300 civilians and between 1,500 and 1,700 military personnel employed to carry out the mission of the center. The total annual payroll exceeds \$15 million.

Water is furnished by wells at each of the three locations. This supply center would probably shift to Feather River water should such become available at a price below the cost of pumping well water. Water is needed for center operations and for the 2,600 persons, both military and civilian, living on the base.

For the near future, little change of significance in operations is forecast for the Marine Corps Supply Center at Barstow. It is the only Marine Corps supply center west of the Mississippi. Possible increases in personnel at Barstow, due to the transfer of certain functions from the San Francisco annex during the next 18 months to 2 years, appear to be compensated by the current trend to decrease defense expenditures and manpower of this character. Shore establishments tend to receive cuts in allotments before operating forces; therefore it appears logical that MCSC at Barstow will probably undergo a slight adjustment downward in allotments and personnel. The Daggett facility has been placed on a list for disposal by the Department of Defense and should be removed from Marine Corps control in the near future.

Over the long run, the outlook at Barstow is for a continued decline because of lowered manpower requirements in the new concepts of warfare and the potential consolidation of the four supply systems into one. At the same time there probably will always be a storage activity here because it is advantageous to store certain items in a desert area, also because there are other military installations in the Antelope-Mojave basin.

(6) George Air Force Base

George Air Force Base is situated about 5 miles from Victorville and about 100 miles northeast of Los Angeles. It was established

originally in 1941 as a flying and bombardier school. Closed following World War II, the base was reactivated in 1950 as a permanent installation, under the cognizance of the Tactical Air Command.

The mission of this establishment is to provide and maintain adequate facilities for Air Force units assigned to the base. At the present time, the principal units operating from George Air Force Base are two air defense groups, a weather squadron, a training squadron, and a tow target squadron.

There are approximately 360 civilian employees and 4,600 military personnel attached to the base or engaged in tenant activities. Total monthly payroll for all personnel exceeds \$1 million. The main operating base occupies approximately 4,800 acres while additional land totaling 7,600 acres is used as a firing range. The total investment in land and capital equipment exceeds \$24 million. Replacement value would be two or three times this figure. Aircraft on the base are valued at several hundred million dollars.

Water is supplied from wells located on private property. There is no anticipated depletion of this source of water, and contract arrangements with a private utility company assure an adequate supply to meet essential needs for the immediate future. Base authorities are interested in an additional source of water, such as the Feather River Project, because of the slowly declining water

table and the desire to use more water to improve living conditions in the desert.

No extensive expansion is planned, nor is it likely that a drastic cutback in personnel will occur at George Air Force Base in the immediate future. This installation is one of the primary air defense installations in Southern California, and as such is not likely to suffer major reductions in personnel due to modified defense expenditures. Minor adjustments would not greatly affect the defense potential of this base because of the increased effectiveness of weapons and airplanes in the past few years.

The long-range future of George Air Force Base in the coming age of missiles is less predictable at this time. However, it appears inevitable that this base will eventually decline in importance as missiles are substituted for manned aircraft. In addition, launching sites will probably be placed along the coastline and in mountainous areas rather than in a flat desert region. Current planning calls for Cooke Air Force Base to be the missile center of the West Coast. The time may therefore eventually come when George Air Force Base undergoes a major re-evaluation and readjustment.

(7) Camp Irwin

Located 35 miles north of Barstow on the outer rim of the area studied by this survey is Camp Irwin, a temporary Army

installation. It is used as a training center for armored and tank units. The camp occupies 637,000 acres and is manned by a station complement of approximately 600 military personnel and 360 civilians. The total acquisition value of land facilities is about \$9 million.

There are no plans for expanding the camp or making it a permanent Army installation in the near future. It is visualized that Army and National Guard units will continue to come here for a long time for desert training and firing practices. Because of the nature of the training, it appears that there will be no changes significant enough to have much effect on the Barstow area.

3. DISPERSAL OF DEFENSE ACTIVITIES

Periodically, the concentration of defense activities in Southern California and their vulnerability to enemy attack have been the subject of considerable public discussion. For the purpose of this study it is believed that any action to disperse defense activities away from the coastal area will not affect the defense installations in the Antelope-Mojave basin because there is little likelihood of the government abandoning the multi-million dollar capital investment in these major activities.

Any attempt to relocate and duplicate these facilities elsewhere would result in an expenditure many times the present book value of approximately \$500 million. In view of the government's economy drive,

the possibility that these installations would be relocated is quite remote. As indicated earlier, this desert area was selected because of certain natural attributes that are vitally important to the missions of these activities. There are few locations left in the United States that would be equally suitable for carrying out the assigned research, development, and testing projects.

In the event that a dispersal program is actually put into effect, new defense facilities could be constructed elsewhere rather than expanding present facilities around Los Angeles. This could achieve, in part, the objective of avoiding concentrations of defense and defense-related activities in a contained area. For these reasons it is unlikely that the dispersal policy will vitally affect existing military installations.

4. EVALUATION OF THE FUTURE INFLUENCE OF DEFENSE INSTALLATIONS ON ECONOMIC DEVELOPMENT OF THE AREA

The defense sector is now so important to the desert community that its economy becomes immediately sensitive to any significant shifts in levels of military expenditures. From our study it appears that prospects for continued rapid growth of these installations, such as has characterized the past, are slim. Some plans for expansion have been shelved during the past few months, and it is likely that other planned increases will be curtailed under current budget policies. Research activities are now at optimum size or are restricted from further sizable expansion due to land

restrictions, test hazards, or the lack of funds. Considering all factors it appears that in all probability there will be some net decline in total personnel within the next several years.

Thus for the immediate future, it seems evident that national defense expenditures cannot be relied upon as heretofore to serve as the spearhead for rapid economic and population expansion. Neither by the same token is it expected that reductions will be so rapid or so drastic as to jeopardize the present economic base.

Looking ahead longer range, the picture seems to be one of fair stability. On the one hand, it seems inevitable that the common use of missiles in the future will result in the further contraction and possible consolidation of activities not engaged in research and development. Existing airfields in the subject area cannot be adapted to missile-launching requirements without large expenditures of money. Therefore, launching sites will probably be constructed in other or more ideal locations to meet strategic and tactical requirements. Furthermore, curtailment of the number of men in the armed forces should result in reduced supply requirements and in the contraction of supply activities.

On the other hand, the major defense activities in this area are of a research, development, or testing character which may be expected to remain of sustained value to the military forces. These will undoubtedly undergo conversion and adjustment to fit the missiles era of the future.

But it is unlikely that the program and expenditure level of their specialized activities will be substantially affected over the long range. This clearly lends a major element of long-range stability to the area.

It should be emphasized that by the time any potential and substantial reductions in general defense activities might be made in this area, their influence on economic growth will be minimized. A rapidly increasing population, as discussed subsequently, and an expanding industrial base will be the primary factors in the growth and economic development of the basin. In this context of continued growth, the area should be able to absorb any diminution of defense activities due to changing concepts and weapons of warfare.

The important consideration for our survey purposes is that over the years immediately ahead, while the Antelope-Mojave area is beginning to acquire economic diversity and strength, the infusion of major defense expenditures, even at a somewhat reduced level from the present, will continue to serve as a foundation for the process of achieving economic advancement. Thereafter, the relative importance of this sector in the total economy will be much less pronounced, and any downward trend should be absorbed without serious repercussions.

V. FUTURE INDUSTRIAL AND COMMERCIAL GROWTH

V. FUTURE INDUSTRIAL AND COMMERICAL GROWTH

Since it appears that agriculture will have little future in the Antelope-Mojave basin, long-range prospects for growth must be founded on its potential for an industry-based economy. As will be discussed in this chapter, a manufacturing industry of some magnitude and diversification can be developed and supported by the facilities and resources of the area and, more specifically, by virtue of proximity to the Los Angeles metropolitan community - provided a stable water supply is assured.

It is important to recognize the interacting relationship between population growth and industrial development. People are attracted to areas offering employment opportunities. At the same time, industry is drawn to population centers because they provide a labor source and a potential market for products. Furthermore, the introduction of industry in a community attracts service, trade, utilities, and other commercial activities which support industrial activity and serve population needs. The projected growth in the Antelope-Mojave area is likely to come about as the result of the interaction of these various forces.

1. APPROACH AND METHODOLOGY

In appraising the industrial potential of the Antelope-Mojave basin, an analysis has been made of its resources, facilities, and economics

advantages. The growth prospects for the major industries currently located in the area have been evaluated. Because of the long period covered by the projection, particular attention has been given to the national, regional, and state trends which will have an influence on the development of the subject area. Over the 60-year period being considered, these are likely to be of key importance.

The difficulties inherent in forecasting industrial development over a lengthy period of time must be emphasized. Advances in the technology of production, for example, may change our present concepts of manufacturing, including space requirements and personnel needs. New products and materials may replace those now being used. Mineral deposits, not now economically feasible to exploit, may be brought into use as richer deposits are depleted. These are but a few of the changes which the decades ahead may bring.

In view of these limitations, it has not been found feasible to express the forecast of industrial development in quantitative terms. It has also been beyond the scope of this report to attempt to trace the evolving pattern of industrial development, decade by decade. Wherever possible, however, a distinction is made between the near-term period covering the next 10 years or so, and the long-range outlook covering the period beyond. In general, we can only attempt to appraise factors, forces, and

conditions which give some insight into the potentialities of the Antelope-Mojave basin for future industrial development.

The sections that follow will present the factors which are favorable to the area's long-term growth, the prerequisites to realizing its full potential; the current status and future prospects for its principal industries; the prospects for new industries; and an evaluation of the effect of cost and availability of water on the area's industrial potential.

2. FACTORS FAVORABLE TO FUTURE INDUSTRIAL GROWTH

There are a number of factors which are favorable to the industrial development of the Antelope-Mojave basin. Some of these are peculiar to the area and relate to its resources, facilities, and economic advantages; others have their origin in national, regional, or state trends. Generally, the effect of the latter will be more pronounced over the long term than during the immediate future.

(1) Abundant Land Suitable for Industrial Uses at a Relatively Low Cost

The subject area is sparsely settled and largely undeveloped. It offers a vast expanse of habitable land suitable for residential, commercial, and industrial uses. Land has been zoned for industry principally in and around the present urban centers. The most notable recent addition has been the 13,000 acres in Los Angeles County

surrounding the Palmdale airport which have been zoned for industry and which will not conflict with aircraft manufacturing and flight testing.

Much of the present supply of industrial land is on or near rail lines, is accessible to roads, and has utilities installed or offers the possibility of connecting to utility systems. Land is offered in parcels ranging in size from one to several hundred acres. The price of the land varies widely depending upon location, size of parcel, and current status or availability of utility, rail, and road services. The range extends from several hundred dollars up to \$5,000 per acre. It is reported that communities which are particularly anxious to attract new industry have held out the offer of industrial sites at token prices.

The areas currently set aside for industry, however, represent only a small portion of the total which could be developed for this purpose. Potential sites of unzoned land ranging in size up to several thousand acres are available from single owners. The price of such land is probably in the neighborhood of several hundred dollars an acre.

By contrast, there are a smaller number of large parcels of land for industry remaining in the Los Angeles metropolitan area.

The price of the available land here reflects the advanced status of the area's industrial development. In the San Fernando Valley industrial acreage is quoted at \$15,000 to \$25,000 an acre. A recent sale in the central Los Angeles area was at \$85,000 an acre.

In its present undeveloped state the Antelope-Mojave area is more receptive and better suited to contain industries which would be considered undesirable in more populous centers. The very size of the area provides isolated locations which would allow for discharging of fumes or creating a high noise level without fear of restrictions, or complaints from residential neighbors. The need for such industrial sites exists and is likely to increase with the scientific and technological advance of civilian and military-related industries.

(2) Convenience of Area to the Nation's Third Largest Market

The Los Angeles metropolitan area is the third largest in the nation, in terms of population, industrial activity, and retail sales, among other economic indicators. Its industrial growth has come about both from expansion of local industries and from new companies coming into the area. In 1956, for example, total new industrial plants and expansions amounting to nearly \$345 million were announced for Los Angeles County. The metropolitan area's population currently is estimated at 6,190,000. This is exceeded by

only seven states in the nation. Furthermore, as is discussed at length in Chapter VII, Southern California is in the path of a major population movement westward from the eastern and central states. The Antelope-Mojave area will be directly affected by this movement which should operate to make fuller use of its economic potential.

The basin occupies a strategic hinterland position with regard to this great market. It is traversed by major transcontinental rail lines and highways, and offers overnight truck service to Los Angeles and other cities south of the mountains. Palmdale, for example, is 65 road miles from the center of Los Angeles, while Victorville is 98 miles and Barstow is 132 miles. The distance from San Bernardino to Victorville is 41 miles, and 75 miles to Barstow. Freeway routes which are expected to be completed over the near future will increase the accessibility of the principal urban centers in the basin to Los Angeles and San Bernardino, as well as Bakersfield and San Joaquin Valley points.

(3) Trend toward Suburbanization of Industry

The movement away from the older, built-up portion of the central city to outlying areas is another force at work in our economy which is likely to be favorable to the industrial development of the Antelope-Mojave area.

Seeking to avoid the congestion of the city and attracted by the lower price of land, the postwar home purchaser has been drawn in increasing numbers to the suburbs. In the Los Angeles area, for example, it has been the communities outside the central city that have shown the greatest growth rates.

Industry, also, has shown a keen interest in suburban areas. They hold out the promise of less traffic congestion; of larger parcels on which to construct more spacious factories and provide parking facilities for employees; of buffer zones to protect against the encroachment of urban expansion and provide room for further industrial growth.

(4) Resources and Facilities Favorable to Industrial Development

In addition to its favorable geographic location in relation to centers of population growth, the Antelope-Mojave area possesses a number of resources and facilities which are important considerations in the evaluation of industrial plant locations.

1. The area has a variety of known mineral deposits that have useful commercial applications. Research is uncovering new, important uses for borate products, for example.
2. A reservoir of skilled and professional workers is being created by the aircraft industry. This industry generally reports no great difficulty in getting personnel to transfer from their other Southern California plants to

the Palmdale community. While currently there is probably a surplus of female labor, new industries of substantial size would find it necessary to secure employees from other areas. If these workers are provided with adequate housing conditions, this problem should not present great difficulties.

3. Natural gas is available from pipelines drawing upon major producing fields. The utility company serving Antelope Valley is one of the largest and strongest in the industry. Industrial rates are comparable to those in a number of other present and potential industrial areas.
4. A dependable supply of electric power is available. To meet growth requirements, a steam-generating plant is being constructed by California Electric Power which serves the Mojave River district. The supply available to Antelope Valley has been augmented by the construction of a steam-generating plant by the Southern California Edison Company. The industrial rates are generally comparable to those available to industry in other areas.
5. Living conditions in the area are generally satisfactory. Local builders as well as those from the adjacent metropolitan areas have responded to the need for additional housing and comparatively large tract developments have been undertaken, particularly in Antelope Valley. A shortage of rental units exists.

Communities in the area have had the same difficulties which plague other fast-growing areas of providing adequate facilities to house the expanding education, health, and recreation needs. These problems, however, are generally being overcome and should not deter growth.

6. The area's desert climate is not regarded as a factor which will seriously limit its industrial development. The growing use of air conditioning by commerce and industry has minimized the desert's principal climatic disadvantage - that of high summer temperatures. There are other aspects of the area's climate which should hold appeal to specific industries. For example, the low relative humidity should be of interest to companies concerned with corrosion or with the need for outdoor storage.

7. The area appears to be less susceptible to the formation of smog than the Los Angeles basin, to the south. There is good air movement, providing a more rapid replenishment of the air supply.

In connection with its policy of opposing the location of industries to which adequate smog control devices cannot be applied, the Los Angeles Chamber of Commerce has undertaken to identify less smog-prone localities within the general economic region which might accommodate such facilities. Presumably, its purpose is to suggest their consideration as alternative sites. The Los Angeles County portion of Antelope Valley is identified as one such area.

8. It appears likely that Antelope-Mojave will succeed in attracting some industries which can no longer be accommodated in the smog basin either because of present or anticipated air control restrictions. While the area is subject to the jurisdiction of the various county-wide air pollution control districts, it is understood that Antelope-Mojave, because of its more favorable atmospheric conditions, would receive permission to accommodate industries not acceptable in the smog basin proper. It is recognized that the subject area has a smog potential; however, it is believed that a major industrial complex can be accommodated before encountering an appreciable increase. Before that time, research programs may have supplied a solution to this problem.
9. The local laws, regulations, and tax structures pertaining to industry are not likely to place the area in a disadvantageous position compared to other areas, nor are these factors which will inhibit its growth.

A summary review of the foregoing factors supports the belief that the area has a significant potential for industrial development, assuming an assured water supply. In considering whether it will achieve this potential, attention should be given to the local "climate" for industrialization. This

has reference to the basic interest of the community in attracting new industry and the extent and effectiveness of its organized effort to do so.

There is a general recognition within the basin of the importance of new industry to its continued growth. Industrial committees have been set up within chambers of commerce for the purposes of promoting the community's industrial sites. District-wide committees encompassing a number of local chambers have been organized. Some of these have been given land to use as an inducement to prospective industry. Large land developers are undertaking their own promotional activities. Railroads and utilities which serve the basin are talking to industrial prospects and showing them the area. These efforts have already produced modest but significant results.

3. PREREQUISITES TO THE ATTAINMENT OF FULL INDUSTRIAL POTENTIAL

Although national and regional socio-economic trends and basic locational factors are favorable to the industrial development of the area, there are other factors which will also influence the future growth of industry. The control of some of these are within the power of the local communities; others depend upon actions and decisions by persons or groups outside of the area. In projecting an industrial development of a size capable of supporting major population growth, it has been assumed that the following prerequisites to expansion will be met:

- (1) A supplemental supply of water will be available by 1970 and will be adequate for all purposes. The prices of the water delivered to municipal systems will be within the range of \$50 to \$100 per acre-foot.
- (2) A comprehensive zoning plan based on a careful study of the probable ultimate land use pattern will be formulated in the near future. Based on determinations of such factors as water supply, sewage disposal, and flood control, it will specify those areas to be developed for urban, industrial, commercial, suburban, and agricultural use; airports and approaches; highways and secondary traffic arteries; and civic centers, schools, churches, parks, and other urban features. The space reserved for industry will be sufficient to accommodate the projected growth of the area and will protect it from the encroachment of residential areas.
- (3) Major residential and community facilities construction programs will be undertaken so that the large numbers of new persons who come into the area to fill labor force needs find adequate living accommodations, schools, recreational facilities, and public services.
- (4) Electric gas and water utilities will continue to add to their capacity and will meet the needs of the growing residential, commercial, and industrial sectors.
- (5) The movement of people and goods will not be hampered by the lack of an adequate system of properly located major and secondary highways. Rail lines will be constructed to serve new industrial centers.
- (6) Facilities will be provided for the collection, treatment, and disposal of sewage and industrial wastes from residential, commercial, and urban residential areas.

These assumptions appear reasonable and feasible of realization in order to provide an environment favorable to the attraction of industrial establishments. In many respects considerable progress has already been made toward their accomplishment.

4. FUTURE PROSPECTS OF AIRCRAFT AND ASSOCIATED INDUSTRIES

Aircraft and associated industries are at present the area's major manufacturing industry. Their activities are centered principally at U. S. Air Force Plant No. 42 and at Edwards Air Force Base.

As was discussed in more detail in Chapter IV, four Southern California aircraft manufacturers are variously engaged at the Palmdale airport in the final assembly, electronic installation, or production flight testing and delivery of jet aircraft to the U. S. Air Force. These companies, Convair, Lockheed, North American, and Northrop, as tenant contractors, occupy plants and share common runways and other flight facilities built by the Air Force.

As indicated in Chapter IV, present and prospective federal economy measures for conventional weapons will probably affect the Palmdale airport. Shifts in the defense program may be expected to result in dislocations and in periods of reduced activity. However, the likelihood that various types of jet aircraft will continue to be part of the defense arsenal over the years immediately ahead, leads to the belief that the airport's unique facilities will continue to play an active role in these production and testing programs.

There is also the possibility that, within the short-term period ahead, commercial jet flight test operations will be established in the

area. Manufacturers of these craft have been forbidden to flight test over the populous centers. Land adjacent to Palmdale airport has been considered for setting up facilities to be used in connection with commercial jet operations.

The presence in metropolitan Los Angeles of an aircraft industry with its supply of skilled and professional workers has been cited as a factor which stimulated the impressive growth of the area's electronics industry during the post-World-War II period. That a similar development in the Antelope-Mojave basin might stem from the Palmdale activities is regarded as a distinct possibility.

Also of importance to the aircraft and missile industries is the Air Force Flight Test Center at Edwards Air Force Base, which is engaged in the flight testing of the latest research and production aircraft and components as well as in static testing of rocket engines. As discussed in Chapter IV, because of the developmental nature of its mission, this test center is not expected to be seriously affected by cutbacks in military expenditures for traditional weapons. As a key research and development facility this installation should be able to adapt itself to new duties directly related to the new emphasis on missiles development.

The assurance that the flight test center will continue to play a part, over the long period ahead, in the development of new weapons is believed to have implications for the industrial future of the area. It

may well be expected that, because of its presence and the availability of suitable industrial sites, companies engaged in related research and development programs will be attracted to the area.

5. PROSPECTS FOR GROWTH OF THE CEMENT INDUSTRY

The production of portland cement is the major nondefense manufacturing industry. The area's large deposits of limestone provide the basis for the existence here of this resource-oriented industry. The industry is also one of the area's oldest, a plant in the Victorville area having been constructed in the early 1900s.

The cement plants now within the subject area are: Riverside Cement Company at Oro Grande, Southwestern Portland Cement Company at Victorville, California Portland Cement Company near Mojave, and Permanente Cement Company in the Cushenbury area of Lucerne Valley. The latter two plants are of recent origin. The four plants employ some 1,600 people and have an annual capacity of about 20 million barrels. This figure represents about two-thirds of the total capacity of the Southern California cement industry.

The industry's principal market is Southern California, although some of its product is shipped to Arizona and Nevada. Its fortunes are closely tied to construction activities in these areas, with the residential sector accounting for the major demand. During the postwar building

boom, the industry has expanded rapidly to keep pace with demand. The plants at Oro Grande and Victorville have increased their capacity almost continuously, with one reporting a sixfold expansion during the past 10 years. The plant near Mojave was put into operation in 1956, while the one at Cushenbury was opened in the spring of 1957. Despite this major expansion program, it is noted that cement was a material in short supply during much of the period before 1956. The drop-off in residential construction and increased output has resulted recently in a more balanced demand-supply picture.

The growth prospects for this industry are very promising. The market which it served is the fastest growing in the nation. It is evident that a population growth of the magnitude predicted for the surrounding market area will result in extraordinary construction demands. While changes may occur in the materials which are used in the buildings, it seems safe to predict that cement will continue to be an important one. It is likely that the major part of the local cement industry's expansion to meet this increased demand will occur in the Antelope-Mojave area and that it will involve both expansion at present plants and construction of new plants. This expectation is based on the fact that the area's vast limestone reserves are capable of handling a substantial further expansion in output over an extended period of time. Also, the availability of additional deposits in undeveloped areas will allow for such expansion without fear of complaint from adjacent residential communities.

This anticipated expansion of the cement industry will provide additional employment opportunities. It should be pointed out, however, that the expected large increases in cement output will probably not be matched by proportionate increases in employment because of growing mechanization in the industry. Furthermore, this industry is not labor intensive and therefore even with expansion cannot be expected to serve as a large-scale employer, although some employment increase is predictable.

6. DEVELOPMENT POTENTIAL OF THE BORATE CHEMICAL INDUSTRY

Located at Boron, Kern County, the site of the world's largest known deposit of sodium borate, are the mining and processing facilities of the Pacific Coast Borax Company, a division of United States Borax and Chemical Corporation. This company produces about 70% of the country's supply of borax, and employs a sizable number of people at Boron. Adding to this, the production of the American Potash and Chemical Corporation and the West End Chemical Company, both located at Searles Lake, results in an output figure which amounts to about 95% of the total national borax supply.

An \$18-million construction program was recently undertaken by United States Borax at Boron designed to increase capacity by 30%. Some seven million tons of earth were removed to permit open pit mining, and new refinery, packing, and shipping facilities were provided. This

expansion reflects the growing demand for borax, and the boron products processed from it. By industry estimates the demand for borax has doubled in the past decade.

Once known principally as a household cleanser, the chemical is now used in hundreds of industrial products, including insecticides, fertilizers, textile fiberglass, and drugs. One of the most notable new uses is as an additive to gasoline. Three oil companies are now offering boron gasoline.

Both United States Borax and American Potash have undertaken research programs in the field of boron chemistry. Its use in heat-resistant plastics, atomic energy, fire-retardant additives for paints, and new steel alloys are being researched, and results indicate enlarged commercial use.

The most intriguing use of boron, and the one which offers the most striking growth prospects, is as a basic ingredient in the so-called "exotic" fuels for the aircraft, rockets, and missiles of the future. Supported by government funds, chemical firms in several parts of the country are engaged in the research and development of these fuels. The industry expects that boron combined with carbon and hydrogen in some form will be the ultimate fuel for such use.

At the present time, boron is used as a basic ingredient in most high energy fuels for aircraft and missiles. A \$36-million plant financed

by the Air Force is under construction in New York for the production of high energy jet engine fuel made from boron products. The fuel to be produced by the Olin Mathieson Chemical Company is said to increase the efficiency of a jet engine by 50% and will enable the B-58 to fly around the world without refueling.

Based on the growth trends of the recent past as well as on current research efforts, the industry expects that demand will at least double again in the next 10 years. An increasing amount of the chemical will find its way into industrial processes and products. The use of boron in gasoline, while currently a small factor in relation to United States Borax's total sales, could become a major factor in the company's sales if a sufficient number of companies decide to add it to their fuels.

It is as a basic ingredient in the exotic fuels of the future that the dramatic growth possibilities of boron lie. Should boron become the key element in these fuels, the industry estimates that there might be an eightfold or more increase in the annual production of borax. The deposits at Boron and Searles Lake are said to be adequate to support present and prospective demand for the foreseeable future.

These growth prospects point to substantially increased employment opportunities in the mining and processing industry. In addition, they suggest the possibility of the establishment of industries engaged in the

manufacturing or testing of boron-based fuels. In this connection it is noted that a small industrial facility is being constructed in the Boron area by the Rex Division of Garrett Corporation for the purpose of conducting a high priority, classified research project for the military. It is understood to involve the future of aeronautics in the realm of higher and faster flight.

There are accordingly bright prospects for industrial development with commensurate employment opportunities in the borate chemical field.

7. FUTURE OF THE MINERAL EXTRACTION INDUSTRY (OTHER THAN LIMESTONE AND BORATE)

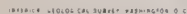
A wide variety of mineral deposits are found within the Antelope-Mojave basin, principally in the San Bernardino and Kern County portions. The cement and boron industries, based upon mineral resources in these areas, were discussed in the preceding section. Aside from these, extractive activities now are of only nominal size. The area, however, appears to have some long-range industrial potential based on the presence of these other mineral deposits. The location of the significant mineral deposits are shown in Map C, following this page.

In the San Bernardino County section of the area, mineral deposits include limestone, clay, tungsten, dimension stone, roofing granules, iron ore, silver, gold, copper, lead, zinc, barite, borate, and pyrophyllite. In the Kern County section, deposits include limestone, clay, sodium

MAP C

SIGNIFICANT MINERAL DEPOSITS
IN ANTELOPE-MOJAVE BASIN





borate, tungsten, salt, gold, silver, pumice, roofing granules, and gypsum. The Los Angeles County portion of Antelope Valley contains deposits of gold, gypsum, limestone, sand, and gravel. Only sand and gravel currently have commercial significance.

Beyond the boundaries of the survey area but within the general vicinity are other noteworthy deposits. Located to the north is Searles Lake, the site of a chemical industry based on the pumping and processing of lake brines. Reference has already been made to the production of borax in this area. Other chemicals produced include sodium sulfate, soda ash, potassium chloride, potassium sulfate, lithium salts, bromine, and salt cake. Much of the common salt consumed in Southern California comes from Searles Lake, adjacent to the investigational area, and some from Koehn Lake, Kern County, which is within the area.

The current value of mineral production within the subject area is not available. An indication of the magnitude is provided by the estimate that limestone production throughout San Bernardino County amounts to about \$35 million annually. Most of this production comes from the Mojave River district. The value of borate production is also estimated to be substantial. Tungsten production was valued at about \$1 million in 1955, but declined in 1956 because of the initiation of a new government purchase program at a lower unit price. This metal is mined in the Atolia district, four miles south of Johannesburg. Local producers

borate, tungsten, salt, gold, silver, pumice, roofing granules, and gypsum. The Los Angeles County portion of Antelope Valley contains deposits of gold, gypsum, limestone, sand, and gravel. Only sand and gravel currently have commercial significance.

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are reported to have had a difficult time competing with imported tungsten, and have been dependent upon government purchase programs.

Principally of historical interest now are the area's gold and silver mining districts. The silver mines in the Calico district, about 10 miles northeast of Barstow, and at Randsburg have been the outstanding sources of silver in California. During the period 1882 to 1896, the mines at Calico yielded silver ore with a total value estimated between \$13 and \$20 million. The Randsburg area was most active in the period 1920 to 1925. The decline in silver prices and exhaustion of known high-grade bodies have led to a virtual cessation of mining. San Bernardino County's total production in 1955 was valued at \$2, 397.

One of the most notable gold-producing areas is the Rand district, which includes several mines in San Bernardino County, but is located principally in Kern County. Mines in this area were particularly active at the turn of the century. Operations have been on a highly selective basis over the recent past because of the fixed price of gold. The outlook for these producers depends, in part, upon international monetary developments.

The value of the current production of such metals as copper, lead, manganese, and zinc is of modest size. Generally, these are available in world markets at prices which cannot be met by area producers.

In summary, over the near-term future mineral deposits in the area other than limestone and borate are not likely to support a substantially increased level of mining activity nor are they likely to exercise a strong attraction to new industries. The long-term prospects are brighter, however, in light of the fact that mineral deposits of less than highest grade and of limited extensiveness will probably receive increased attention in the future as we continue to deplete our best deposits and as advancements in mining technology increase the economic feasibility of their use. This trend has significance to the future development of the area's metallic deposits. The primary metal industries are identified as those which might be attracted to the area's resources, particularly its iron ore deposits.

8. MANUFACTURING INDUSTRY CATEGORIES GENERALLY
SUITABLE FOR THE AREA

Through analysis of the area's basic locational factors, national and regional industrial trends, and current industrial development in the Antelope-Mojave area, it is possible to identify, by broad categories, the types of manufacturing activities which might be expected to locate there over the long-term future. Specific factors governing the suitability of the area for particular manufacturing industry categories and which have been assessed in this study are: markets, sites, location of production materials, labor supply, industrial fuel, water, power, transportation,

distribution facilities, and climate. Based on these considerations and factors affecting the selection of plant locations, the following industry categories are identified as being among those suitable for establishment in the Antelope-Mojave area:*

Food and kindred products, particularly poultry and dairy products.

Apparel, particularly outerwear.

Furniture and fixtures, including household furniture, store fixtures, doors, and screens.

Chemical and allied products, principally industrial chemicals using the mineral resources of the area.

Stone, clay, and glass products such as concrete, gypsum, and plaster products.

Primary metal industries, particularly die castings of nonferrous metals and alloys.

Fabricated metal products, particularly metal stampings and sheet metal work.

Electrical equipment and supplies such as components and light assemblies.

Transportation equipment, specifically aircraft and parts.

Electronics which include portions of the aircraft and parts industry, electrical machinery and equipment industries, the instruments industry, and ordnance industry. (Not an official industrial classification.)

This listing is not intended to be exhaustive or definitive, but rather to illustrate the number and variety of industrial categories which might

*Using U. S. Government standard industrial classifications.

find the area attractive over the long-term period ahead. The suitability of the area will naturally vary as between the individual communities within the basin. It is perhaps unnecessary to point out again the difficulties involved in forecasting with preciseness the extent to which each of these industry categories may contribute to the area's growth and the timing of their development. Nevertheless, it appears from the above that the area offers a favorable environment for the attraction and reception of a diversified industrial base.

Concrete evidence of the suitability and attraction of the area for new industry is manifested by the prospective addition to the industrial scene of two companies in an industry new to the area, which are slated to begin construction of plants in the Mojave district within the near future. These companies now have manufacturing facilities in the Los Angeles area and are engaged in the production of precision cast aluminum and magnesium parts for the aircraft and missile industries. Among the reasons given for the prospective move are; the limited room for expansion in present location; availability of large industrial sites at a low price; basic appeal of desert living; and a desire to leave the crowded conditions of the metropolitan center. The exact number of persons to be employed in these plants is not known. However, neither company anticipates any difficulty in attracting either skilled or unskilled labor.

9. WATER SUPPLY AND COST FACTORS

Uncertainties concerning the long-term supply of ground water and the requirement in some areas that industry develop its own resources has had a limiting effect upon the industrial development of the area. With the assumption that an affirmative decision regarding the availability of supplemental water will be announced by 1960 and that such water will be delivered by 1970, this picture changes fundamentally. These events may be expected to have a profoundly stimulating effect upon the area's industrial development. Even during the interim period between 1960 and 1970, a stepped-up level of industrialization might be anticipated.

Despite assurances of a supply of supplemental water, it is unlikely that the Antelope-Mojave basin will be attractive to the large water-using industries. Companies whose manufacturing processes entail the use of water as a part of the product have shown a preference for areas which can rely entirely upon their local ground and surface resources. Paper mills and textile manufacturers may be cited as illustrations of these.

For all manufacturing industries other than the large water users, the cost of water represents a minor component of total production costs; factors other than this price are controlling in their plant location decisions. Principally for this reason, it is our finding that whether supplemental water is made available to municipal systems at \$50 or up to \$100

per acre-foot will make slight difference to the over-all industrial development of the area. Even after adding an increment to cover costs of building distribution systems from the city mains to individual companies, these prices will be competitive with those which are likely to be charged by other south coastal areas seeking comparable industries.

10. RELATED INCREASES IN TRADE, SERVICE, AND OTHER NON-MANUFACTURING INDUSTRIES

The economic development in Antelope Valley since 1950 has provided a good, close-at-hand illustration of the effect of an expansion of manufacturing industries upon employment in the trade, services, and other nonmanufacturing industries. Available statistics suggest that for every employee added by manufacturing industries another is added by the nonmanufacturing industries, including contract construction, trade, transportation, personal, and financial services.

The extent to which an increase in manufacturing employment provides jobs in the other industries is likely to vary widely. Factors which determine its effect include the types of manufacturing industry which move in and the stage of the area's economic development. It is fairly obvious, however, that although it is not possible to quantify precisely the multiplying effect which industrial growth in the Antelope-Mojave area will have upon total employment, it will be of major proportions and an important source of jobs to the vastly increased population.

11. SUMMARY OF INDUSTRIAL POTENTIAL

It is our conclusion that the Antelope-Mojave basin has a considerable industrial potential and will experience a significant development over the next 60-some years, assuming an adequate supply of water is assured. This growth will involve both the expansion of present resource-based industries and the establishment of industries new to the area. The military aircraft industry, while not likely to experience further major expansions, will provide a measure of stability over the next 10 to 15 years and may serve to attract commercial aircraft, missile, and electronics activities. In addition, an extensive and varied group of potential new industries are suitable to the peculiar features and characteristics found in the basin area.

Over the next decade or so industrial development in the Antelope-Mojave basin should reflect a slow but momentum-gathering rate, achieving a greater degree of diversity and strength as the stimulating effects of the expected arrival of supplemental water are felt. A quickening of the tempo of industrial development should follow the actual availability of such water in 1970. In the decades that follow, the population pressures of the growing metropolitan center should provide an increasingly insistent stimulus to the achievement of the area's industrial economic potentialities, as people and industry seek adjacent areas in which to live and work.

VI. TRANSPORTATION FACILITIES
IN RELATION TO PROJECTED GROWTH

VI. TRANSPORTATION FACILITIES IN RELATION TO PROJECTED GROWTH

Served by three major railroads, two transcontinental bus lines, and key north-south and east-west highways, the Antelope-Mojave basin is generally well situated with respect to transportation. The area occupies a strategic position with regard to passenger and freight movement into California via southern transcontinental routes in respect to traffic destined for the south coastal cities and for the San Joaquin Valley and points north.

Transportation centers like Barstow and Mojave, in particular, feel the impact of the transportation industry. In the former community, Atchison, Topeka & Santa Fe Railway is the largest civilian employer. In Mojave, some 7% of the town's labor force is employed by Southern Pacific Railroad and over 10% is employed in providing services and facilities to tourists driving through the area. County and state highway maintenance stations and highway contractors also contribute to the importance of transportation industry employment in the valley.

1. RAILROADS

The south-east line of the Santa Fe passing through Barstow is the main line from the West Coast to the east. Rail traffic to Bakersfield and

northern California moves westward from Barstow to Mojave on Santa Fe's tracks. From here, Santa Fe uses Southern Pacific lines over the Tehachapi Pass to Bakersfield. The line south from Barstow goes to San Bernardino and to Los Angeles.

The plans for constructing a freight car classification yard at Barstow by the Santa Fe have been temporarily suspended. Although the exact timing of the construction of this yard is indefinite, it probably will be completed within the next few years to handle anticipated increases in traffic. Because this classification yard will utilize the latest in electronic equipment, the increase in number of personnel will be negligible.

The Union Pacific line northeast of Barstow is the main line of the system to Salt Lake City and points east. The Union Pacific uses Santa Fe's tracks from the vicinity of Daggett to San Bernardino.

The main line of the Southern Pacific's inland (San Joaquin Valley) route serves the principal communities of Antelope Valley and proceeds into Los Angeles via San Fernando Valley. Traffic destined for the eastern and southern United States then moves on through Arizona, New Mexico, and Texas.

Southern Pacific has surveyed a right of way from Palmdale to Summit for the construction of a branch line. Arrangements are being made by Southern Pacific with Santa Fe to use the latter's lines from

Summit through El Cajon Pass in order to connect with the Southern Pacific line near Colton. This route would enable shipments between the east and northern and central California to by-pass the Los Angeles railway yards. Such would not only expedite eastern shipments, but would also relieve traffic congestion in the Los Angeles area.

Southern Pacific is purchasing land near Palmdale at the present time for the above-mentioned branch line between Palmdale and Summit. The completion date has not been set, but it appears likely that the by-pass will be constructed within the next five years. The latest central traffic control equipment will be installed on this line. The use of this type of equipment enables railroads to achieve double track flexibility with single track line.

All railroad representatives consulted have emphasized that spur tracks or branch lines would be constructed as required to meet the demands of industry in the Antelope-Mojave area. Santa Fe, for example, recently constructed a branch line to Cushenbury Springs to service the Permanente Cement plant. Present facilities plus planned improvements should provide this desert area with adequate rail transportation for the foreseeable future.

2. HIGHWAYS

State highways and county roads will be of primary importance to the development of the Antelope-Mojave basin because they will be the

principal means of access to and egress from this region. Freeway-type construction of main traffic arteries will be essential to move the traffic expected to be generated by the predicted influx of people and the anticipated increase in volume of transcontinental traffic across the region.

Traversing the Mojave Desert, U. S. Highway 66 is now a major transcontinental route to the east. From San Bernardino to Victorville it is a four-lane divided highway. The last contract has just been awarded for constructing a new four-lane, 30-mile expressway between Victorville and Barstow. This \$6,000,000 project will be completed in about two years. The stretch between Barstow and the California border is now a two-lane road which is adequate to handle present traffic beyond Daggett. As part of the interstate system it will undoubtedly be widened by 1970.

Joint Highway 91 and 466, connecting Barstow and Las Vegas, is inadequate to handle current traffic safely. This stretch of highway will become an expressway in the near future as it is a part of the current federal interstate highway construction program. At Barstow, Route 91 separates from Route 466 and joins Route 66.

Highway 466 west to Mojave and over the Tehachapi Mountains to Bakersfield is now the major access road from the Mojave Desert to the Central Valley of California and the Pacific Northwest. A large portion of it is obsolete in terms of current construction standards. The portion of Route 466 from Boron to Bakersfield in Kern County has been surveyed

for widening to a four-lane divided highway. In fact, that portion of the road from Bakersfield to the vicinity of Bear Mountain will be expressway in the next few years. Following this, the road between Bear Mountain and Tehachapi will be improved. Timing of the construction of the expressway on to Mojave, Boron, and Barstow will be dependent upon traffic volume. As a main traffic artery from Las Vegas and points east to the Central Valley, it appears that this should be accomplished about 1970.

Principal north and south routes are Highways 6 and 395. A joint road from Bishop to the Tulare-Kern County line, the two highways separate at this point and serve both sides of the Antelope-Mojave basin. In this area both highways are only two lanes. However, heavily traveled Route 6 should become a freeway from Mojave to a point south of Palmdale within 5 or 6 years according to current plans. The entire route from Palmdale to Los Angeles should become a freeway within 10 years. (Frequently referred to as the Mint Canyon Freeway.)

Travel on Route 395 is light and there are no plans for improving the road in the immediate future. This route joins Highway 66 south of Victorville.

Of major importance to the development and growth of this region is the plan to construct a freeway from Ventura to the vicinity of Palmdale and on east to Highway 66. This route would join Highway 6 for part

of the distance to Palmdale. It is visualized that this project should be completed about 1970.

This contemplated building program by the Division of Highways utilizes all funds estimated to be apportioned from federal and state sources during the next 10 to 12 years. It should meet the basic needs of the area for interregional and intraregional travel until about 1970. To meet longer range requirements sufficient right of way has been purchased to provide for additional highway lanes and the construction of interchanges. In addition, regional planning commissions and the Division of Highways coordinate long-range planning to eliminate problems encountered in previous years.

County roads are adequate at present, and master plans for additional and improved county roads have been prepared through 1970. However, accomplishment of these master plans is problematical in view of the fact that counties have insufficient funds to keep up with the total current needs. The inadequacy of county road funds is further emphasized because all plans do not anticipate the large increases in population that are forecast for this area. County agencies are doing what they can to alleviate the road problem by planning for maximum utilization of limited funds.

In summary, it appears that state highway programs for the next decade will meet the progressive requirements of the Antelope-Mojave

area. Highway needs will not be a deterrent to development. On the contrary, they should facilitate the entry of people and industry to this region. However, under existing conditions, with current resources, it appears that county governments will lack the capacity to meet the expanding need for additional and improved county roads. A more adequate source of funds will have to be found to develop an adequate county road system for the future.

3. TRUCK AND BUS LINES

Victorville and Barstow are on a transcontinental route of Continental Trailways and Greyhound Bus Lines. The latter company also provides north and south services to Antelope Valley communities. Also using the principal highways of the area are a number of trucking companies. Several local trucking firms provide freight service to Lancaster. At least four lines provide service from Barstow to Los Angeles, with others providing direct service to San Francisco and major southwest, midwest, and eastern cities.

Present bus and truck lines will expand, and new carriers may be expected to enter this region as soon as the demand for additional service is evident.

4. AIRPORT FACILITIES

Airport facilities in this region are almost wholly confined to government installations and small private airports. The only commercial

airline serving the survey area is Bonanza Air Lines which recently inaugurated service from Los Angeles to Apple Valley. Southwest Airways has been granted permission to land at the U. S. Air Force Plant No. 42 at Palmdale until the new Los Angeles County Airport, to be located north and west of Lancaster, is completed.

The site for the General William A. Fox Airfield near Lancaster has been purchased by the county, and construction should be completed late in 1958. The runway will be 6,000 feet long with additional land available to extend it to 8,000 feet. The airport is being built primarily to handle small commercial airplanes and to meet the requirements of private individuals and industrial aviation. Construction specifications do not provide for the larger commercial airplanes to land on a regular basis. Rather, General Fox Airport would be used by large planes only when other airports are fogged in.

Plans for other airports are indefinite. Both Barstow and Hesperia want to build airports for private airplanes and industrial aviation, but no positive action has been taken toward acquiring sites.

Within the next few decades the need for commercial facilities should increase. Population growth should be able to support a sizable public airport in the Palmdale-Lancaster area and another one between Victorville and Barstow. This will require planning by county agencies and zoning to provide for adequate airport space.

5. GENERAL TRANSPORTATION OUTLOOK

Over all, it appears that the system of major highways and other transportation facilities should keep pace with the transportation requirements of the Antelope-Mojave basin for the immediate future. State highway construction is probably ahead of actual requirements for the next decade and will tend to stimulate the growth and economic development of the area.

On the other hand, should Feather River water be made available to the Antelope-Mojave basin, both state and county agencies will find it necessary to reappraise their highway and road programs in the light of greater prospective population increases over the next several decades. Advance planning, including necessary financing, should prevent major problems from arising in the future and should result in the development of a sound basic highway system which can be easily expanded as a firm foundation for the network of roads and streets needed long range by potential population growth.

In summary, therefore, there is every reason to believe that transportation facilities for the subject area will at all times be fully adequate to serve the projected population growth and will in no wise operate as an impediment to such growth. They should in fact, serve as a stimulant to economic development.

VII. NATIONAL AND STATE GROWTH TRENDS
AFFECTING ANTELOPE-MOJAVE DEVELOPMENT

VII. NATIONAL AND STATE GROWTH TRENDS AFFECTING ANTELOPE-MOJAVE DEVELOPMENT

The population and economic growth of the Antelope-Mojave basin for the period 1960 to 2020 will, to a large extent, be conditioned by the growth pattern that will occur in the rest of the state and the nation. The most significant immediate factor that will influence the rate and magnitude of expansion for this underdeveloped region is its geographic proximity to the rapidly growing Los Angeles metropolis.

1. THE GROWTH OF THE NATIONAL ECONOMY AND POPULATION

Although the Antelope-Mojave basin possesses many valuable resources to foster an expanding economy, external forces, primarily economic and urban, will be the major determinants of its future development. Of paramount importance is the context of national and state growth in which its future will unfold.

(1) National Economic Growth

Almost universally, recent governmental and semiofficial studies forecast the greatest economic expansion over the next 60 years that this nation has yet witnessed. Barring a major war or some unforeseen natural catastrophe, it is generally estimated that

the gross national product will continue indefinitely to grow at a rate equivalent to that which has been achieved over the past 50 years. Over the long term this has averaged out to a 3% annual growth rate.

With this as a base and utilizing unofficial long-range data of authoritative federal agencies, a potential gross national product by the year 2020, in the neighborhood of \$2,800 billion, is projected at 1956 prices. This represents better than a sixfold increase over present levels of about \$434 billion annually.

There are numerous factors contributing to a spiraling economy which can operate to bring about a national productivity of these prodigious magnitudes over the next 60 or more years. Changes in technology growing out of electronics and automation appear to be ushering in new methods of production and distribution that will be as far-reaching as the introduction of machinery with the advent of the Industrial Revolution. New and cheaper sources of energy, atomic and solar, will provide new locational opportunities for industry and quicken the pace of growth. Major developments are anticipated in chemistry, metallurgy, and agriculture which will give a whole new range of products as significant as plastics, heat-resistant alloys, soil conditioners, and other materials which are now transforming the economic scene. Increasing emphasis upon research and the systematization of invention are also accelerating production trends.

Technological developments will be paralleled by social advancements. Scientific knowledge and labor skills are being enhanced by the broadening and extension of education. Improved worker productivity will result in higher incomes which in turn should give rise to significant progress in the standards of living for everyone. More efficient productivity will raise the quality of transportation, distribution, and consumer services. Furthermore, on the basis of present trends, government may be expected to continue its support of programs designed to increase individual security and to provide an environment favorable for national economic growth.

Thus, the national climate for expansion over the next several decades is, we believe, highly favorable as a base for towering growth in the economy of Southern California.

(2) National Population Growth

Over the next 60 years the unprecedented expansion of the national economy will be reflected in (and will equally be an outgrowth of) dramatic population increases. In estimating national population growth to the year 2020 we have relied basically upon official data and projections of population trends prepared by the United States Bureau of the Census for the period up to 1975. Thereafter we have employed unofficial population data adjusted for economic

factors as derived and used by authoritative federal agencies. Even assuming a somewhat moderated birth rate after 1980, these projections show a national population of between 400 and 430 million by 2020 A.D. In other words, the population of the United States may be expected to increase more than twice as much in the next 60 years as it did in the preceding 168 years since the Republic was founded.

A number of factors are contributing to this prospective tremendous upswing in national population.

1. An extended period of prosperity with high personal incomes will, if past experience holds true, result in a continuation of high marriage and birth rates.
2. The trend toward larger families in evidence since World War II should continue as home modernization and household conveniences make the tasks of child-rearing less burdensome.
3. Progress in medical science will be reflected in lower mortality rates and in a significant extension of the life span.
4. The total living and social environment can be expected to be conducive to population growth.

Estimated national population growth through the survey period is reflected in Table 23, following this page. This projects the present average growth rate of about 1.6% annually with some fall-off forecast after 1980 largely on the grounds that there may be some decline in the birth rate from present high levels. Nevertheless,

TABLE 23

UNITED STATES POPULATION
1940-1950 with Projections to 2020*

August 1957

<u>Year</u>	<u>Population (in thousands)</u>	<u>Rate of Growth</u>
1940	131,954	
1950	151,234	14.6%
1960	180,000	19.3%
1970	211,000	17.1%
1980	249,000	18.0%
1990	291,000	16.8%
2000	334,000	14.9%
2010	377,000	12.8%
2020	415,000	10.0%

*Figures derived from Current Population Reports, United States Bureau of the Census, and from data furnished by other agencies of the federal government. These projections are essentially an extrapolation of present population growth rates with a reduction in birth rate forecast after 1980.

numerically the nation's population may be anticipated as increasing from thirty to forty million for each decade after 1960.

It should be borne in mind that these figures are based upon a continuation of prosperous conditions. Should the national productivity increase less than expected, the corresponding impact upon population growth might reduce population size by as much as 10%, resulting in a population of about 380 million by the year 2020. On the other hand, if the present fertility rate continues with high prosperity, then a population of better than 440 million might be anticipated. It should be emphasized that a figure somewhere between 400 and 430 million appears to be the best for purposes of national planning on the basis of all the evidence now available.

(3) Future National Population Distribution

There are a number of factors and trends with respect to the probable regional and state distribution of the nation's future population which are significant for the Antelope-Mojave basin.

First, it is clear that a progressively larger proportion of the nation's future population will be urban. Although greater dispersal of population throughout the country may be expected, the vast majority of people will settle within the perimeters of well-established urban centers. Existing metropolitan communities will

continue to grow, causing land suitable for urban activities on the outskirts of large cities to be at a premium.

Likewise the trend toward westward migration should continue for the decades ahead, at least until such time as there is a greater balance of populations between the eastern and western seabords. Among western states, all signs indicate that California can continue to anticipate the greatest growth from regional migration.

2. THE ECONOMIC AND POPULATION GROWTH OF CALIFORNIA

The rate of population growth in California will be determined by the extent to which the state maintains an environment favorable to economic expansion. Conditions of prosperity are particularly significant for population migration into the state.

(1) Factors Favorable to the Growth of the California Economy

Forces which appear favorable to the sustained growth of the California economy are the following:

1. California's climate and living advantages should continue to be major attractions to the nation's population provided the state can adequately meet the problems growing out of urban congestion.
2. The rate of expansion of the national economy should produce a higher rate of growth in California than the national average since the rate of westward migration will be stimulated and factors of distance will become less important as communications and technology advance.

3. California's economy is diversifying and its rate of growth in the fields of basic manufacturing and durable goods should continue to be higher than for many other regions for the next few decades. The state is in a strategic position, as a result of past expansion in air-craft and related activities, to be in the forefront of new industrial developments associated with electronics and automation.
4. Although a sudden and sharp decline in certain categories of defense expenditures would have some dislocating effects, particularly for Southern California, reductions of the likely magnitude will have only a temporary impact and will not affect long-time basic growth. Furthermore, these reductions would likely be offset by increases for rocket and missile development.
5. The state's recreational and tourist attractions should contribute materially to the well-being of the state's economy as the standard of living rises and more leisure time becomes available.
6. The business and governmental climate of California should continue to be favorable to state growth. Youthful and venturesome industries and popular acceptance of advance practices of public administration should keep stagnation to a minimum.

In short, conditions similar to those which have favored the growth of California in preceding decades should prevail for the indefinite future. Over the next half century it is not unreasonable to anticipate that California will continue to enjoy a rate of growth greater than the national average. To state it statistically, if national productivity rises at the rate of 3% annually for the next half century, a condition now foreseen by most economic experts, then it is fair to predict that the rate of California's economic growth should be from 1/2% to 1% higher per year for the same period.

(2) Population Projections for California

California's prospective rate of population growth may be projected in different ways. One method, illustrated in Table 24, following this page, projects the state's population as a percentage of the national total. A second method estimates population on the basis of factors of natural increase and migration as illustrated in Table 25, following page 146. These are discussed in the following sections.

(3) Proportion of National Total

Ever since the turn of the century, California's rate of growth has been greater than that for the nation at large. The state's proportion of the total population has accordingly been steadily increasing. Thus, between 1900 and 1950 California's percentage of the national population grew from 1.95% to 7.00%, or nearly a 1.0% increase per decade. It should be noted that the rate of growth has been greatest since 1940.

Using the national population growth projections presented earlier in Table 23, the future population of California as a percentage of the national total is estimated in Table 24.

On the basis of this projection, California may be expected to reach a population level of more than 50 million by the year 2020 based upon an estimated 415 million national total. This estimate

TABLE 24

PAST AND PROJECTED POPULATION OF CALIFORNIA
AS A PERCENT OF TOTAL NATIONAL POPULATION*
1900-2020

August 1957

<u>Year</u>	<u>Past and Projected National Population (in thousands)</u>	<u>California as a Percent of National Total</u>	<u>Past and Projected California Population (in thousands)</u>
1900	76,094	1.96	1,490
1910	92,407	2.60	2,406
1920	106,466	3.34	3,554
1930	123,077	4.64	5,711
1940	131,954	5.27	6,950
1950	151,234	7.02	10,609
1960	180,000	8.75	16,000
1970	211,000	10.25	21,600
1980	249,000	11.25	28,000
1990	291,000	11.75	34,200
2000	334,000	12.00	40,100
2010	377,000	12.13	45,800
2020	415,000	12.20	50,600

*Figures for 1900-1950 are drawn from California's Population in 1957, California State Department of Finance, p. 9. United States Projections for 1960-2020 are based upon Table 23.

assumes that the state's population as a percentage of the national total will grow until 1970 at only a slightly reduced rate from the high levels of 1940 to 1957. After 1970 the rate of growth will gradually experience a further decline, under our forecast, predicated upon a marked fall-off for in-state migration and an increasing decline in the birth rate. However, this will still produce unprecedented aggregate growth building up to the 50 million figure by 2020.

(4) Projection Based on National Increase and Migration

Another method of projection involves estimating population growth on the basis of the factors of natural increase and migration. Past statistics are, in this connection, particularly revealing for California. From Table 25, following this page, it can be seen that better than 70% of the state's population growth during the period 1900 to 1950 was due to migration. Though the ratio of migration relative to natural increase has been declining since 1940, nevertheless the fact that well over 250,000 people annually are still coming to California from other states reflects how important migration is for maintaining a high rate of state population growth.

Recent growth rates of migration and natural increase can be projected to give a fairly sound estimate of probable state population size in the years immediately ahead. However, projections beyond two decades involve some major assumptions concerning future levels

TABLE 25

COMPONENTS OF POPULATION CHANGE
IN CALIFORNIA
1900-1955*

August 1957

Years	Total Change	Components of Change			
		Natural Increase		Net Migration	
		Number	Percent	Number	Percent
1900-1910	890,300	115,000	12.9	775,300	87.1
1910-1920	1,050,700	170,200	16.2	880,500	83.8
1920-1930	2,252,400	370,500	16.4	1,882,000	83.6
1930-1940	1,227,900	177,900	14.5	1,050,000	85.5
1940-1950	3,679,000	1,021,000	27.8	2,658,000	72.2
1950-1955	2,368,000	881,000	33.4	1,487,000	66.6

*Prepared by the Financial Research Section, State Department of Finance. Figures for 1900-1940 from Commonwealth Club of California Research Service, The Population of California, by Davis McEntire, Table 10, p. 21, using data prepared by Charles N. Reynolds and Sara Miles for the Central Valley Project Studies. 1940-1950 from Bureau of the Census, Current Population Reports, Population Estimates, Series P-25, No. 72, Table 3, p. 5. 1950-1955 figures were furnished by the Financial Research Section of the California Department of Finance.

of fertility and the status of the California economy relative to other states and regions. Table 26, following this page, presents the results of our projection of the state's population growth to the year 2020 based upon probable rates of net migration and natural increase.

In formulating the estimates in Table 26 it has been assumed that beginning about 1980 there will be a gradual decline in the rate of natural increase due to a reduction in the birth rate from present high levels as the state begins to approach more closely the nation in its population characteristics. It has also been assumed that after 1970 a fairly sharp decline in migration will occur as California achieves a more mature economy approximating the national average and as some of the by-products of urbanization make living advantages of California comparatively less attractive than is the present case. Sometime between 1970 and 1980 it is expected that births will provide a greater proportional addition to the state's population than migration.

On the basis of the projections calculated by these methods and assumptions, a population of over 52 million could be expected for California by the year 2020. This would involve an increase of from 5 to 6 million each decade after 1960.

(5) Comparative Results

Comparison will show that the projections derived in Table 26 are slightly higher than those derived in Table 24, particularly for

TABLE 26

PAST AND PROJECTED POPULATION OF CALIFORNIA
ON THE BASIS OF RATE OF CHANGE IN
NEW MIGRATION AND NATURAL INCREASE*

August 1957

<u>Decade Ending</u>	<u>Natural Increase</u>		<u>Net Migration</u>		<u>Total Population</u>
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	
1940	177,000	3.1	1,050,000	18.6	6,950,000
1950	1,021,000	14.8	2,658,000	38.5	10,609,000
1960	2,006,000	18.6	3,019,000	28.8	15,600,000
1970	2,881,000	18.4	3,230,000	20.7	21,700,000
1980	3,468,000	16.4	3,002,000	13.8	28,300,000
1990	4,076,000	14.4	2,606,000	9.2	35,900,000
2000	4,340,000	12.4	2,999,000	6.0	41,400,000
2010	4,308,000	10.4	1,659,000	4.0	47,400,000
2020	3,983,000	8.4	1,279,000	2.7	52,600,000

*The percentages for the decades 1950-1960 and 1960-1970 are based upon figures furnished by the Financial Research Section, California State Department of Finance.

the decades 2000-2020. However, the difference between 50,600,000 and 52,600,000 is not too significant for our purposes.

It should be recognized that if the rate of national and state economic expansion turns out to be somewhat less than predicted, California's population by the end of the survey period might be as much as 10% lower, or approximately 46 million. Contrariwise, if birth rates are maintained at the present rates for several more decades, and if the rate of in-state migration does not decline as rapidly as has been estimated, the population of California could be several millions larger than the above estimates.

In the light of all factors and considerations, however, it appears that a figure of approximately 50 million by the year 2020 is reasonable and feasible as a basis for state planning. Admittedly, these estimates for California population growth are higher than other recent projections prepared by local and state authorities. This may be ascribed largely to the fact that factors of national population and economic trends, as forecast by authoritative national agencies, have been given greater weight in our estimates.

3. THE GROWTH PICTURE FOR SOUTHERN CALIFORNIA

The forces which are influencing the rapid growth statewide in California are operating strongest in Southern California, particularly

with respect to those counties which are in the coastal plain of metropolitan Los Angeles. In 1950, for example, the population of the four counties of Los Angeles, Orange, Riverside, and San Bernardino constituted 45.4% of the state's total, a figure that is projected to rise to 47.7% by 1960, based upon the growth that has already taken place in the last seven years.

(1) Economic and Population Growth of the Los Angeles Metropolitan Area

There is a sound basis for expecting sustained growth in the greater Los Angeles metropolitan region. The area has a rapidly expanding industrial base. It now ranks third in the nation in value of manufactured products and has become a most important center for the electronics industries. At the present rate of expenditures, it will soon be the second largest retail trading area in the nation. Personal income is rising at a higher rate than for most other regions. Much open land is available for urban expansion. That the climate and economic opportunities are still continuing to offer strong attraction to people elsewhere is reflected in the statistics which show that over 200,000 people per year have migrated into this four-county region since 1950, accounting for over two-thirds of the population growth during this period.

Projections of population growth for the four counties comprising the greater Los Angeles metropolitan community are

presented in Table 27, following this page. These estimates are based upon the assumptions that (1) the present trends toward industrialization and suburbanization will continue, and (2) the region will be able to solve adequately the problems of smog, traffic, and other vicissitudes of urban congestion.

Under our estimate the population of the four designated counties may be expected to increase from approximately 7-1/2 million in 1960 to over 23 million by 2020. A numerical growth of from 2 to 3 million is predicted for each decade during the survey period. We anticipate that this area will continue to be the residence of nearly one-half of the state's total population in 2020.

Estimates for the total population of the four counties were based upon the relationships of growth to the entire state. It is expected that this area will expand at a slightly greater rate than the state average until 1980. After 1980 there will be a gradual decline in the growth rate as higher densities prevail and as population flows toward less densely settled areas elsewhere in the state.

(2) Growth Factors in Specific Counties

In projecting the population growth for each of the four counties, account has been taken of the fact that each will probably grow at different rates at different periods based upon their relationship to

TABLE 27

PAST AND PROJECTED
POPULATION OF COUNTIES IN THE
LOS ANGELES METROPOLITAN AREA
(In Thousands)

August 1957

Year	State Total	Four County Total		Los Angeles County		Orange County		Riverside County		San Bernardino County	
		Number	Percent*	Number	Percent**	Number	Percent**	Number	Percent**	Number	Percent**
1900	1,490	236	15.8	170	72.0	20	8.4	18	7.6	28	11.8
1910	2,406	630	26.2	504	80.0	34	5.4	35	5.6	57	9.0
1920	3,554	1,120	31.5	936	83.6	61	5.5	50	4.5	73	6.5
1930	5,711	2,541	44.5	2,208	87.0	118	4.6	81	3.2	134	5.3
1940	6,950	3,182	45.8	2,786	87.5	130	4.1	105	3.3	161	5.1
1950	10,609	4,819	45.4	4,152	86.2	216	4.5	170	3.5	281	5.8
1960	16,000	7,634	47.7	6,290	82.4	588	7.7	267	3.5	489	6.4
1970	21,600	10,764	49.7	7,859	72.9	1,361	12.6	539	5.0	1,005	9.3
1980	28,000	14,079	50.2	9,011	64.0	2,210	15.7	1,084	7.7	1,774	12.6
1990	34,200	17,023	49.7	10,316	60.6	2,622	15.4	1,770	10.4	2,315	13.6
2000	40,100	19,566	48.7	11,427	58.4	2,935	15.0	2,348	12.0	2,856	14.6
2010	45,800	21,767	47.5	12,407	57.0	3,221	14.8	2,786	12.8	3,352	15.4
2020	50,600	23,363	46.1	13,247	56.7	3,411	14.6	3,084	13.2	3,621	15.5

*Percentage of State Total

**Percentage of Four County Total

Note: The figures used in projections for California are from Table 24. The figures used for projections for Los Angeles, Orange, Riverside, and San Bernardino Counties for 1960 were furnished by the Financial Research Section, California State Department of Finance.

the center of the metropolitan area. Thus, the older areas such as those in Los Angeles County should grow more slowly as the metropolitan area disperses. Furthermore, the Los Angeles area may be expected to maintain relatively lower population densities with higher rates of dispersal when compared with metropolitan centers in the East.

Table 27 indicates that the population of Los Angeles County will gradually decline as a percentage of the total metropolitan area but will still constitute 56.7% by the year 2020. Major factors in maintaining this county's high rate of numerical growth, particularly after 1980, will be (1) an increase in densities with a greater number of multiple residential structures in areas along the coast, and (2) the increase in population predicted for the Antelope Valley section of the county.

Orange County is expected to experience its greatest rate of growth between 1960 and 1970, San Bernardino County between 1970 and 1980, and Riverside County between 1980 and 1990. As estimated, these three counties will each have over three million population in the year 2020, with San Bernardino County containing the largest number and Orange County acquiring the highest density.

Although a portion of Kern County is located in the Antelope-Mojave basin, it was omitted from these forecasts. It is believed

that the major determinants of growth for the Kern County portion of the survey area will emanate from the Los Angeles metropolitan area. No significant urban movement into the basin area from the Bakersfield region is foreseen for the period under study.

4. THE PATTERN OF URBAN DISPERSAL IN THE LOS ANGELES COASTAL BASIN

For purposes of this discussion the Los Angeles coastal basin includes all of Orange County and those portions of Los Angeles, Riverside, and San Bernardino Counties which lie in the coastal watershed. The Antelope-Mojave basin and the desert portions of Riverside and San Bernardino Counties are outside of the coastal plain.

The foregoing population projections portend some difficult problems of accommodation to urban growth for Southern California and particularly for the nondesert areas. Most significant to the rate of development in the Antelope-Mojave basin are:

- The future pattern of urban settlement in the Los Angeles coastal basin.
- The amount of land available and suitable for urban activities.
- The degree of density that may be expected.

(1) The Metropolitan Settlement Pattern

With respect to urban settlement, the pattern which has developed in the Los Angeles metropolitan area is similar to other

metropolitan areas with the exception that growth has been more rapid and characterized by a higher degree of dispersal. Prior to 1950 the rate of population growth was greatest in Los Angeles County, the center of the metropolitan area. Since 1950, however, the rate of growth has been greater in adjacent counties, notably Orange and San Bernardino, as population and urban activities began to spill over from more developed areas.

Every sign indicates that there will continue to be an outward push in all directions from the central metropolis until all of the relatively flat land of the entire coastal plain is covered with urban activity. A number of factors have been influential in accelerating the rate of this dispersal in recent years. The opening of the Santa Ana and San Bernardino freeways has stepped up the pace of development in Orange and San Bernardino Counties. The availability of less expensive land in outlying areas has also influenced industrial and subdivision dispersal. Planned decentralization of commercial centers, such as has taken place in the East San Gabriel Valley, is likewise fostering urban spread.

In general the areas along the coast may be expected to urbanize more rapidly than the areas farther inland since these are more favored climatically by a majority of people. Thus, for example, Orange County should move toward saturation more quickly

than Riverside County. On the other hand, there is a strong movement of industry into the East San Gabriel Valley toward San Bernardino and Riverside so that development in this region will not lag far behind.

Once the entire Los Angeles coastal plain has been relatively well settled alternative urban sites will be the Ventura County coastal plain and the Antelope-Mojave basin. Both areas at their nearest points are nearly the same distance from the center of Los Angeles and both are separated from the metropolitan center by mountain ranges. Both of these areas also have some natural advantages for urban development. The Ventura plain has a more even climate and the possibilities of a good port. The Antelope-Mojave basin has substantially larger quantities of land available at cheaper prices, has good and improving transportation facilities, and is located with access to both the San Bernardino and San Fernando portions of the metropolitan area.

It would appear that both the Ventura plain and the Antelope-Mojave basin areas will be subject to urban pressures at the same time. Assuming that both areas receive supplemental supplies of water at approximately the same date, it may be expected that both areas will grow simultaneously at a rapid pace, particularly after 1980 as urban development pushes outward from the Los Angeles plain.

(2) Amount of Land Available for Urban Development in the Los Angeles Coastal Basin

The timing and rate of growth of the Antelope-Mojave basin will be largely determined by the amount of land which is available for urban settlement in the Los Angeles coastal basin and the rate at which this is used up by expanding population. Land which is suitable topographically and otherwise for urban activities on the coastal plain is considerable but nevertheless limited.

There are now approximately 1,825,000 acres in the coastal watershed of the four counties (Los Angeles, Orange, Riverside, and San Bernardino) which are susceptible to urban development. This total acreage includes lands currently developed as well as undeveloped in the coastal area. These statistics were derived by combining the State Water Resources Board figures of probable ultimate irrigated acreage and the acreage of probable ultimate urban and suburban areas. All of this land is deemed to be suitable for urban use, and it is expected that it will eventually become fully urbanized with varying degrees of population density. In general, this land is composed of the relatively flat areas of the Los Angeles coastal basin. The composition by counties of this potential urban area is reflected in Table 28, following this page.

TABLE 28

LAND ACREAGE SUITABLE FOR URBAN DEVELOPMENT
IN PORTIONS OF COUNTIES WITHIN THE
LOS ANGELES COASTAL BASIN*

August 1957

<u>Counties</u>	<u>Gross Area</u>	
	<u>Acres</u>	<u>Square Miles</u>
Los Angeles	808,700	1,264
Orange	332,600	520
Riverside	426,800	667
San Bernardino	<u>257,000</u>	<u>402</u>
Total	<u>1,825,100</u>	<u>2,853</u>

*Figures for this Table were derived from "Water Utilization and Requirements of California," State Water Resources Board, Bulletin No. 2, Vol. I, 1955, Chapters 2 and 6.

(3) Population Densities in the Los Angeles Coastal Basin

In order to gain some measure of the population pressures which will be built up in the Los Angeles area and which will exert a direct impact on Antelope-Mojave urban development, it is necessary to analyze present and future population density patterns. Thus, the rate at which the population of the Los Angeles coastal basin flows over into the outlying Antelope-Mojave basin will be largely governed by the degree of density which comes to prevail in the coastal area. More population obviously can be absorbed in the Los Angeles basin if high rather than low rates of densities prevail.

The Los Angeles metropolitan area currently has the lowest rate of density of any large urban area in the county. In 1950, Los Angeles County had an over-all density of 3,206 persons per square mile of usable urban land. Some small portions of the city of Los Angeles have densities of over 13,000 persons per square mile, and a few smaller cities such as Santa Monica have over 10,000, but the majority are settled at much lower rates. As has been noted, there is a trend toward higher densities in many portions of metropolitan Los Angeles as open spaces are appropriated and more intensive use is made of land.

To get some picture of the probable densities of those portions of the counties in the Los Angeles coastal basin, projections were

made to 2020 based upon probable ratios of population growth to land use. (See Table 29, following this page.) The projections in this table were derived by balancing estimated population growth in the four counties (Table 27) with the total land by counties available for urban development in the coastal basin (Table 28). They indicate the probable maximum population which the coastal basin will accommodate by the year 2020.

Pursuant to these estimates it is anticipated that by 2020 the portion of the coastal basin in Los Angeles County will have reached a population density close to saturation at a figure of 8,850 persons per square mile for the area of 1,264 square miles given in Table 28. Although this density figure is somewhat lower than the 10,000 persons per square mile currently being employed by the Los Angeles County Regional Planning Commission, it assumes a somewhat larger area as suitable for urban development.

The densities for the other counties in the Los Angeles coastal basin are expected to be lower than for Los Angeles County, which will continue to be the center of the metropolitan area and more intensive in land use. The density for Orange County is established at 6,560 persons per square mile, San Bernardino at 5,234, and Riverside at 3,980 by 2020. Orange County is expected to have a density considerably greater than Riverside and San Bernardino

TABLE 29

POPULATION DENSITY PROJECTIONS
FOR PORTIONS OF COUNTIES
WITHIN THE LOS ANGELES COASTAL BASIN*

August 1957

Year	Los Angeles County		Orange County**		Riverside County		San Bernardino County	
	Density***	Number	Density***	Number	Density***	Number	Density***	Number
1950	3,206	4,144,241	416	216,000	210	140,000	656	263,642
1960	4,904	6,198,000	1,131	588,000	318	212,000	1,035	416,000
1970	6,057	7,656,000	2,617	1,461,000	658	439,000	2,134	858,000
1980	7,689	8,581,000	4,250	2,210,000	1,378	919,000	3,692	1,484,000
1990	7,470	9,542,000	5,042	2,622,000	2,090	1,394,000	4,238	1,740,000
2000	8,110	10,251,000	5,646	2,935,000	2,825	1,884,000	4,905	1,972,000
2010	8,529	10,781,000	6,194	3,211,000	3,561	2,375,000	5,199	2,090,000
2020	8,850	11,188,000	6,560	3,221,000	3,980	2,655,000	5,234	2,104,000

*See Table 28 for amount of area susceptible to urban development.

**All of Orange County is included within the coastal basin.

***Population density per square mile.

Counties since the trend is toward more multiple residences and smaller lots near the coast. Moreover, it was assumed that both San Bernardino and Riverside Counties would be somewhat behind Orange County in the cycle of urban development.

Table 29 indicates that there will be a gradual increase in densities for each county by decades to 2020. The densities for Riverside and San Bernardino Counties particularly reflect a high degree of dispersal.

(4) Implications of Density Projections

Densities of the magnitude indicated will create population pressures which can only be satisfied by further urban dispersal. Thus, with 2,853 square miles of suitable land available for total urban use in the metropolitan coastal basin, it is clear by arithmetical calculation using the projected increasing densities that a maximum population of some 19.4 million can be accommodated within this area by the year 2020. Since our estimates indicate an ultimate population growth of about 23.3 million in the whole four-county area it is evident that intensive movement toward more outlying territories within the four counties is unavoidable in the decades ahead. This will be accelerated as densities move inexorably upward.

It should be emphasized that the foregoing density projections and rates of dispersal apply only to Los Angeles, Orange, San Bernardino,

and Riverside Counties. During the period under study additional population movement will take place out of metropolitan Los Angeles into Ventura and San Diego Counties and perhaps to some extent into other areas of Southern California. This spill-over will be above and beyond that which will occur in the outlying portions of the four counties under study and in excess of the 23.3 million total population estimated for such counties in 2020.

The magnitude of this movement into Ventura and other adjacent counties has not been measured since the subject is outside the scope of the present study. However, it is safe to predict that counties such as Ventura and San Diego may also be expected to experience high rates of growth paralleling those of the area under study. In fact, were it not for the availability of these areas for further urban development the expansive pressures would force an even greater population movement toward Antelope-Mojave than is predicted. With a 50 million population estimated for the entire state in 2020 A.D. and even with 23.3 million of this total expected to reside in the four major counties under consideration (including Antelope-Mojave), it is obvious that many other sections of the state will also witness dramatic urban growth over the next 60 years.

Within the four-county area, however, the remaining expanse suitable and available for accommodating the bulk of this metropolitan spill-over, once the higher densities are approached in the coastal portion, is the Antelope-Mojave basin. As greater densities emerge on the coastal

plain and the dispersal movement is stepped up, there is every likelihood that more urban activity and population will push into this vast and accessible area.

These density projections for the Los Angeles coastal basin are used in forecasting the growth of the Antelope-Mojave basin described in the succeeding chapter.

VIII. 'THE ANTELOPE-MOJAVE BASIN
AS A SATELLITE COMMUNITY OF LOS ANGELES

VIII. THE ANTELOPE-MOJAVE BASIN AS A SATELLITE COMMUNITY OF LOS ANGELES

The great expansive forces operating at the national and state levels will find localized expression in the Antelope-Mojave area. There is no evidence to indicate that this outlying basin will be by-passed in the expansion of the economy of Southern California. On the contrary, its strategic setting and favorable conditions for development give the area a high probability for extraordinary growth over the decades. Not only will the subject area be influenced by factors conditioning the growth of Southern California generally, but it will in turn by virtue of its location and available area make possible the realization of the full potential for expansion of metropolitan Los Angeles.

This chapter summarizes the forces and factors which will influence the growth of this adjacent area and presents quantitative population estimates through the period covered by the survey.

1. FACTORS FAVORABLE TO GROWTH

The Antelope-Mojave basin has many characteristics and conditions which are advantageous in terms of attracting urban activities and fostering development.

(1) Geography of the Basin

The chief asset of the basin is its geographic location and the size of its area. It is on the perimeter of the fastest growing metropolitan region of the country. It is an area larger in size than many of the smaller east coast states, with over 65% of its acreage topographically suitable for urban development. Although separated from the Los Angeles coastal basin by a mountain range, the journey from one basin into the other can be made in less time than it takes to make many home-to-work commuting trips in the Los Angeles area.

Within the Antelope-Mojave basin are a number of large areas which from the standpoint of space should be favorable to intensive urban activity. Cities can be more efficiently planned and developed than for many other locations in Southern California. Much of the land suitable for urban development is located at points such as Palm-dale and Victorville which have closest access to the Los Angeles coastal basin.

The basin is also strategically situated from the standpoint of interregional transportation and communication. On the basis of present rail connections and projected highway planning, much of the traffic between the eastern and southern parts of the United States and central California will be able to shorten distances and traveltime by

by-passing the more central portions of the Los Angeles metropolitan area.

(2) Climate

The development of Antelope-Mojave will be hastened by the comparative attractiveness of the climate for many urban pursuits. It offers a warm, dry climate, without extended periods of extremely hot or cold temperatures. With technology rapidly improving living arrangements and making facilities such as low-cost air conditioning available, the climatic attractiveness of the area will increase.

The area also has some climatic advantages for particular industries. The military, for example, has found that large stocks of materials can be preserved under most favorable conditions. Warehousing, repair installations, and similar activities can be conducted under propitious circumstances.

Smog represents a remote though potential menace to the basin's climate. However, it is presumed that adequate knowledge has been derived from the Los Angeles experience to enable proper safeguards to be instituted before polluted atmosphere becomes a deterrent to growth.

(3) The General Movement toward Dispersal

A major trend of urban growth is its increasing rate of dispersal. The Los Angeles metropolitan area, strongly influenced by the advent of the automobile, has established a pattern of urban spread which is greater than that for any city of the world of comparable population size.

All available evidence indicates that the trend toward dispersal will continue and hence directly affect the future of Antelope-Mojave. Industry is increasingly using more land per square foot of building space. Commercial areas are being developed in outlying suburbs where more land is available. The lot sizes for residences are rising. Urban development is being extended more rapidly along transportation arteries.

As the Los Angeles coastal basin becomes more urbanized, dispersal into the Antelope-Mojave territory will be accelerated by other factors. Growing congestion will cause more people to seek relatively less urbanized areas. The open spaces of the subject area will become more inviting to persons seeking relief from air pollution, noise, transportation inconveniences, and similar unfavorable conditions.

(4) Industrial Attractiveness of the Antelope-Mojave Basin

The Antelope-Mojave basin has some distinct advantages for new industries as already described in Chapter V. Most notable is the availability of large parcels of land at relatively low prices. With the trend toward more ground-consuming structures and larger parking lots and buffer zones, new and expanding industry is finding it increasingly difficult to acquire fairly sizable tracts of land at suitable prices in the more urbanized portions of the Los Angeles basin. While it is true that as time passes land sites in the Antelope-Mojave area will tend to become more competitive with those in metropolitan Los Angeles, this factor will not become significant for some time to come.

Moreover, industries moving into the Antelope-Mojave basin will be able to plan their industrial operations relative to site more effectively. Greater discrimination can be used in the location of buildings and parking lots, and more protection can be provided against adjacent urban activities which are annoying. Much will depend, however, upon the effectiveness of county planning and zoning.

Planning commissions of the three counties within the basin recognize the need for setting aside industrial areas. Los Angeles County expects to have a master plan for its portion of the basin completed within a two-year period. If, as expected, San Bernardino

and Kern Counties follow suit within the next few years, greater assurance will be given to an expanding industry which wishes to be protected against indiscriminate urban development.

(5) Transportation

Projected improvements in transportation, already discussed in Chapter VI, should make the Antelope-Mojave basin one of the best-served metropolitan areas in the country. At present the chief deficiency is the need for more good interregional highway connections. Most strategic in the development of the basin's growth will be (1) the completion of the Mint Canyon Freeway from Palmdale to San Fernando Valley which will give quicker access to the western portion of the Los Angeles metropolitan area, and (2) the construction of a freeway across the basin which will link present Highways 6 and 66 and make possible a quick interregional by-pass of the center of Los Angeles. These major thoroughfares slated for completion by 1970 together with other highway improvements which are planned should be a major factor in stimulating the growth of the subject area.

The basin's rail facilities are excellent. The area is now served by the three major railroads operating in the Pacific Southwest. With the completion of the Southern Pacific's branch line from Summit to Palmdale the area will have good rail connections in all directions. The basin has an excellent prospect of becoming a major

rail staging and transfer center for goods moving both in and out of the Southern California area.

The air facilities of the Antelope-Mojave basin should likewise be favorable to future growth. Although it is not expected that the basin will become a major air connection for the center of the Los Angeles metropolis, nevertheless all-year flying weather should cause the area to have an increasingly heavy air transport volume as population and urban activities grow.

(6) Employment Opportunities

The major factor in the growth of the Antelope-Mojave basin in the long run will be the extent to which jobs can be provided for a resident population. The evidence available does not indicate that this area will become a bedroom city of the San Fernando or San Bernardino portions of the Los Angeles coastal area, though with the improvement of highways some home-to-job commuting will probably take place. Moreover, it is not likely that a major residential development of metropolitan proportions will occur without an industrial base, though considerable residential building may be expected for persons who wish to have semidesert residences or for persons who are not directly tied to a place of occupation.

As already indicated in Chapter V, industrial development in the basin area should progress at a good rate over the next decade,

but no large-scale expansion of new industries can be predicted based on the short-range outlook. However, after 1975 or 1980, the pressures of metropolitan growth in the Los Angeles coastal plain plus the inherent attractions of the area should begin to bring large-scale industry into this basin. After that period, self-generating industrial development should set in as the economy broadens and diversifies with expanding employment opportunities.

The Antelope-Mojave area should have an adequate labor supply to meet the needs of industrial growth for at least the next two decades. The favorable labor supply may indeed serve as a magnet for attracting industry. Communities within the basin are beginning actively to push industrial growth in order to provide employment as they seek to broaden originally established resort and residential developments into more diversified communities.

(7) Recreational Advantages

Aside from the natural appeal of the desert which appears to interest a growing number of people, the floor of the basin does not have much to offer in the way of unusual setting or recreational attractiveness. The chief benefits to its residents are climate and space.

However, the area is favorably situated with respect to recreational advantages to be found in the surrounding mountains. The basin dweller is much closer than the Los Angeles resident to camping, hunting, and fresh water fishing sites in the surrounding region as well as to locations in the High Sierra. In the winter-time the area has quick access to warmer deserts as well as to snow sport centers. Many persons have already chosen residence in the basin for recreational reasons and are more likely to do so in the future as the shorter working week and more leisure time provide more recreational opportunity.

2. FACTORS WHICH MAY MODERATE IMMEDIATE URBAN GROWTH

Given the tremendous economic and population expansion that is forecast for Southern California, it appears inevitable that factors favorable to Antelope-Mojave basin growth will cause it eventually to be the site for a large urban development. Nevertheless, there are a number of factors which may tend to moderate urban development in the Antelope-Mojave basin for the immediate future. Chief among these are the following:

(1) Uncertainty of Adequate Water Supply

The evidence now available indicates that many industries are reluctant to consider the basin for plant location because of uncertainties as to water availability. Actually, there appears to be enough water in underground sources to support a fairly sizable

urban development for many years to come. However, the lack of a firm water supply is at least a psychological obstacle to growth.

Should the decision to supplement the Antelope-Mojave basin by imported water be delayed for some years, this will have a direct impact on the rate of growth for the decades immediately ahead. Furthermore, should competing water needs in other regions reduce the possibility of furnishing the basin with an adequate supply to meet all foreseeable needs, the rate of growth will be retarded. An early and adequate water supply, therefore, looms large in basin planning and development.

(2) Competition with Other Potential Urban Areas

The growth rate of the subject area will be less rapid if other areas outside the Los Angeles coastal basin develop advantages that are more favorable to urban activity than can be offered by this semiarid basin. Under present conditions the only area within the perimeter of the Los Angeles metropolitan area which appears to be competitive with the Antelope-Mojave basin is the Ventura area. As has been previously noted, both areas are likely to be subject to urban pressures at about the same time, the rate of growth depending upon how facilities such as water and transportation are developed to meet urban needs. It is our view that under equally favorable conditions both areas will move ahead simultaneously.

Otherwise it does not appear that any region close to Los Angeles will offer the advantages of Antelope-Mojave for major metropolitan expansion. It is expected that the San Diego metropolitan area will continue to have a high rate of growth somewhat disassociated from Los Angeles. It is also expected that there will be considerable urban growth in the southern portion of San Joaquin Valley, but not at the expense of Antelope-Mojave. The desert region in the vicinity of Palm Springs will see considerable resort and residential growth, but it does not appear to be the likely site of large industrial expansion. Some small agricultural-processing industries have already established in this desert region, but the Palm Springs area is not considered competitive to the more advantageous sites available in the Antelope-Mojave area for large-scale industrial growth.

(3) Excessive Land Speculation

Growth in the Antelope-Mojave basin could be retarded in the early years of its development by excessive land speculation. In recent months there has been an unusually large number of land transactions for speculative purposes in some areas of the basin. Inflated land values will not only result in slowing down bona fide business investments within the area, but they could place the Antelope-Mojave area at a disadvantage in competition for urban activity with other regions.

A certain amount of speculation is natural and to be expected in areas such as this with strong urban potential. The announcement to bring water to the basin could, however, set off an orgy of speculative activity such as took place in San Fernando Valley and elsewhere in the Los Angeles region in the 1920s with unfortunate consequences for healthy growth.

(4) Availability of Urban Facilities

The rate of growth in the Antelope-Mojave basin could also be delayed by the failure to provide adequate community facilities such as streets, sewers, or schools. It could likewise be hindered by the failure of local governments to plan adequately for desirable land uses for various urban activities. There is every evidence, however, that these factors will be adequately covered and will not operate as significant growth deterrents.

There is some possibility that the more populous sections of Los Angeles and San Bernardino Counties may be overdemanding for the expansion of services and facilities in the coastal basin at the expense of the basin on the other side of the mountains. However, both of these counties have now had considerable recent experience with the problems that have resulted from rapid-growing but poorly planned communities in the coastal basin. It may therefore

be anticipated that a greater effort will be made to keep abreast of urban developments within Antelope-Mojave.

3. ESTIMATED POPULATION GROWTH

In formulating quantitative population estimates for the period 1960-2020 on the basis of all the factors and considerations previously discussed, it is well to restate the governing premises and assumptions which underlie our survey. In recapitulation, these concern the continued expansion of the national economy and population, the absence of international conflict, the public announcement of Feather River Project plans by 1960, and the delivery of the required volume of imported water to the subject area by 1970.

In addition to these fundamental premises certain other assumptions more specifically related to the subject area have been made for purposes of estimating population growth:

- There will be no sudden and major cutback in defense activities within the basin for the next five years. Slowly declining defense activities can be absorbed without dislocating consequences for the basin economy.
- The freeways to connect the Antelope-Mojave basin with San Fernando Valley and the west side with the east side of the basin will be completed by 1970.
- The State of California and local governments within the Antelope-Mojave basin will foster policies of encouraging growth in this area to relieve metropolitan congestion and to conserve resources in other regions.
- Air pollution will be controlled and will not be a deterrent to growth.

- Density patterns in the Los Angeles coastal basin will gradually increase, but will not exceed 8,850 persons per square mile by the year 2020 for the gross urban area of Los Angeles County; 6,560 for Orange County; 5,234 for San Bernardino County; and 3,980 for Riverside County.
- By 1965 the three counties within the Antelope-Mojave basin will have developed master plans of land use for their respective areas including suitable reservations for industrial and residential usages.

(1) Rate and Magnitude of Population Growth

Population estimates have been formulated in the light of all the factors and forces affecting Antelope-Mojave growth discussed in this report as well as on the basis of the foregoing assumptions. These considerations and evaluations lead to the conclusion that the subject area will be the site of what may be properly characterized as a remarkable long-range urban growth, particularly in the light of the relatively small base from which large-scale expansion will start.

In quantitative terms it is estimated that the population of the Antelope-Mojave basin will grow from the present figure of 131,000 to 344,000 by 1970, spiraling up to 1,956,000 in the year 2000 and reaching a figure in the neighborhood of 3,600,000 by 2020. These estimates are presented in Table 30, following this page. The rate of population growth for the area is also depicted graphically on the

TABLE 30

PROJECTED POPULATION GROWTH
FOR THE ANTELOPE-MOJAVE BASIN
1960-2020
August 1957

County	Kern County Portion		Total	
	<u>Number</u>	<u>Percent Increase</u>	<u>Number</u>	<u>Percent Increase</u>
	5,805		21,939	
8	20,497	253.1	60,015	173.6
	36,000		131,000	
2*	42,000	56.1*	167,000	178.3*
5	67,000	59.5	344,000	106.0
3	102,000	52.2	703,000	104.4
8	154,000	50.9	1,302,000	85.3
4	220,000	42.2	1,956,000	50.2
4	291,000	32.2	2,886,000	47.5
6	363,000	24.4	3,609,000	25.0

TABLE 30

PROJECTED POPULATION GROWTH
FOR THE ANTELOPE-MOJAVE BASIN
1960-2020

August 1957

<u>Year</u>	<u>Los Angeles County Portion</u>		<u>San Bernardino County Portion</u>		<u>Kern County Portion</u>		<u>Total</u>	
	<u>Number</u>	<u>Percent Increase</u>	<u>Number</u>	<u>Percent Increase</u>	<u>Number</u>	<u>Percent Increase</u>	<u>Number</u>	<u>Percent Increase</u>
1940	7,729		8,405		5,805		21,939	
1950	16,084	108.2	23,434	178.8	20,497	253.1	60,015	173.6
1957	53,000		42,000		36,000		131,000	
1960	72,000	347.6*	53,000	126.2*	42,000	56.1*	167,000	178.3*
1970	165,000	129.2	112,000	111.5	67,000	59.5	344,000	106.0
1980	361,000	118.8	240,000	114.3	102,000	52.2	703,000	104.4
1990	671,000	85.9	477,000	98.8	154,000	50.9	1,302,000	85.3
2000	1,042,000	55.3	784,000	64.4	220,000	42.2	1,956,000	50.2
2010	1,463,000	40.4	1,132,000	44.4	291,000	32.2	2,886,000	47.5
2020	1,869,000	27.8	1,377,000	21.6	363,000	24.4	3,609,000	25.0

*For decade 1950-1960

accompanying chart, following this page. For comparative purposes population projections for the nation, state, and four coastal counties are shown.

While the above numerical growth is impressive it should be noted that for the decade 1960-1970 the rate of growth (in terms of percentage increases in relation to the preceding period) will not be as spectacular as the decades from 1940 to 1960. This obtains because no type of urban expansion is expected to take place in the immediate future which will match the accelerated growth produced by military and defense activities of the war and postwar years.

Nevertheless, even though the industrial development of the Antelope-Mojave basin will be at moderate rates until about 1970, we believe that the population increase of some 200, 000 projected between the present time and that date is quite reasonable in view of the urban base which has already been established. The announcement of the availability of Feather River water, as assumed, by 1960 will induce the migration of urban activities including some new industries into the subject basin. Increasing land costs and shortages in the Los Angeles coastal basin during the coming years should also accelerate the rate of dispersal. This should be reflected in a rise in urban residences and subdivisions accompanied by a growth in supporting business services and community facilities.

accompanying chart, following this page. For comparative purposes population projections for the nation, state, and four coastal counties are shown.

While the above numerical growth is impressive it should be noted that for the decade 1960-1970 the rate of growth (in terms of percentage increases in relation to the preceding period) will not be as spectacular as the decades from 1940 to 1960. This obtains because no type of urban expansion is expected to take place in the immediate future which will match the accelerated growth produced by military and defense activities of the war and postwar years.

Nevertheless, even though the industrial development of the Antelope-Mojave basin will be at moderate rates until about 1970, we believe that the population increase of some 200,000 projected between the present time and that date is quite reasonable in view of the urban base which has already been established. The announcement of the availability of Feather River water, as assumed, by 1960 will induce the migration of urban activities including some new industries into the subject basin. Increasing land costs and shortages in the Los Angeles coastal basin during the coming years should also accelerate the rate of dispersal. This should be reflected in a rise in urban residences and subdivisions accompanied by a growth in supporting business services and community facilities.

After 1970 the subject area may be expected to register its greatest numerical gains in population. The assumed availability of sufficient water and the pressure of growing densities in the Los Angeles coastal area will be the major causes for the spurt in growth. The volume of growth will be greatest between 1980 and 2020, when a numerical increase of slightly less than 3,000,000 is expected to take place.

The possibility of population trends in excess of the above should not be disregarded. It is quite possible that the passage of the decades will reveal higher population increases than our predictions. This could happen, for example, should our presumably conservative assumptions as to a somewhat declining birth rate after 1980 and probable future population densities in the coastal area prove to be conservative in fact.

Likewise the possibility of a lower rate of growth must be recognized. Forces and circumstances may well change over a 60-year period which could dilute the forecast growth. Nevertheless, we are prone to conclude that with our present lights the above population estimate of an ultimate 3,600,000 is realistic. Even if this should fall off considerably, however, it would still comprise a large metropolitan community with correspondingly high water service requirements.

In this connection it may be commented that the above forecasts of population growth are somewhat conservative in comparison with those recently prepared by the Regional Planning Commission of Los Angeles County. This commission, using the density method of projection, has forecast a population of 800,000 by 1975 for the Los Angeles County portion of Antelope Valley alone, and forecast a higher rate of growth for the period thereafter than is projected in this study.

(2) Population Growth by County Sections

The Los Angeles County portion of the subject basin is expected to contain 1,869,000, or slightly over half of the area's population by 2020. This part of the basin will grow at a somewhat greater rate until 1980 and thereafter with a substantially greater volume. The more rapid rate of growth for the Los Angeles County area (mainly Antelope Valley) during the next two decades is predicated upon its relatively more advanced stage of development, more favorable land sites for urban activities, and the further development of industrial activities based upon already established aircraft industries.

The San Bernardino portion of the Antelope-Mojave area will also grow to substantial proportions, reaching a population of 1,377,000 by 2020. It will have the greatest rate of growth for any of the three

counties for the decades 1980-2010. Its growth likewise is based upon substantial industrial development, though as it now appears this development may be somewhat less centered and less integrated than in Los Angeles County. This part of the basin will continue to have much attractiveness for large residential developments. As urban expansion increases in both the San Bernardino and Los Angeles parts of the basin, considerable residence-to-job commuting may be expected to take place between the two areas.

The portion of the basin which lies in Kern County is not only the smallest in area but farthest away from the center of the Los Angeles metropolitan area. Moreover, a large part of the Kern County area topographically suitable for urban development lies within permanent military reservations. For these reasons, this part of the basin will experience less urban growth between 1960-2020 than the other regions. The population for this area is estimated to reach 100, 000 by 1980 and 363, 000 by 2020. A considerable portion of this population will likely be composed of persons who work in industries in Los Angeles and San Bernardino Counties.

(3) Location and Density

Population and urban activities can be expected to grow at lower densities in the Antelope-Mojave basin than in the coastal

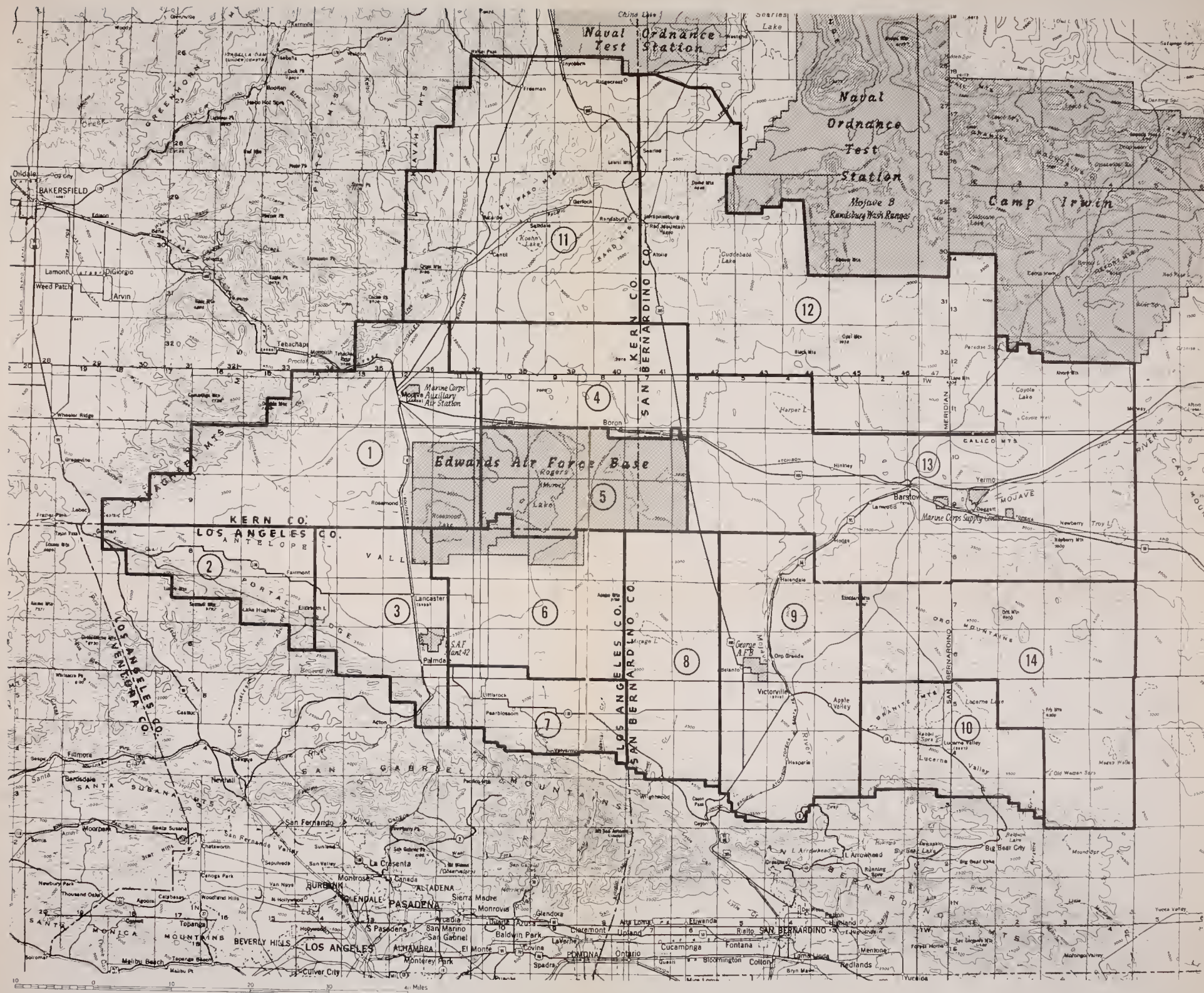
basin area. This will involve a greater absorption of land for all urban uses. In some areas, however, quite heavy concentrations of population may be expected. Needless to say, the pattern of urban spread will be greatly influenced by the pattern of imported water delivery.

The fastest growing section of the Los Angeles County portion will be Study Area No. 3*. This area is also expected to contain the largest percentage of the population by 2020. Moreover there will be considerable urban growth in Areas No. 2, No. 6, and No. 7, Areas No. 2 and No. 7, because of their proximity to the mountains, should become favored residential locations.

In the San Bernardino County portion of the basin, urban growth will be a little less centered than in Los Angeles County. Areas No. 8, No. 9, No. 10, and No. 13 may be expected to have both industrial and residential growth. Area No. 9, which has closest access to the eastern end of the Los Angeles coastal basin, will grow at a more rapid rate. Area No. 12, because of its distance from the Los Angeles metropolitan area, and Area No. 14, because of its mountainous character, will account for only a small proportion of the county's population during the period under study.

*These areas have been geographically defined by the Department of Water Resources for purposes of this survey. See Map D, following this page.





Urban growth in the Kern County part of the basin will be greatest in Study Area No. 1, since this district is in closest proximity to the industrial community that will be centered around the Palmdale-Lancaster communities. Areas No. 4 and No. 11 will have a slower rate of growth though they will become the sites of considerable residential population and some industrial development.

Since agriculture will gradually decline, as discussed in Chapter III, farm population will fall off by 1980 to an insignificant proportion in relation to the whole. The population forecast for the area will be essentially of an urban character.

Even with the sizable ultimate population of 3,600,000 estimated for the subject area, only a portion of its habitable acreage will be placed under urban usage. Thus, even assuming a low gross urban use factor for all purposes of one acre per family (3.5 to 3.7 persons), there is absorbed only about one million acres of the total area. This contrasts with the 3,159,000 acres of habitable land available in the area.

4. EFFECT OF WATER COSTS ON MUNICIPAL USE

In the above estimates no distinction has been made with respect to the minimum and maximum assumed prices of imported water. Unlike

Urban growth in the Kern County part of the basin will be greatest in Study Area No. 1, since this district is in closest proximity to the industrial community that will be centered around the Palmdale-Lancaster communities. Areas No. 4 and No. 11 will have a slower rate of growth though they will become the sites of considerable residential population and some industrial development.

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4. EFFECT OF WATER COSTS ON MUNICIPAL USE

In the above estimates no distinction has been made with respect to the minimum and maximum assumed prices of imported water. Unlike

water for irrigation purposes, in which the price element becomes a decisive factor as to profitability, costs for water within the assumed range of \$50 to \$100 per acre-foot are not too significant for municipal and industrial purposes.

For residential purposes water costs up to as high as \$100 per acre-foot are not a major factor in determining location. Many urban users in both the subject area and in the metropolitan community are now paying rates approaching the minimum assumed rate of \$50 per acre-foot. While the \$100 rate would admittedly be considered high for residential water, this factor alone will not serve to retard settlement since so many other considerations are more important.

APPENDIX A

HARVEY O. BANKS
Director

GOODWIN J. KNIGHT
Governor

ADDRESS REPLY TO
1100 S. Grand Avenue Los Angeles 15
P. O. Box 15718 MADison 6-1515

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
Los Angeles

July 22, 1957

Booz, Allen & Hamilton
Management Consultants
550 South Flower Street
Los Angeles 17, California

Attention: Mr. Ralph Jones

Gentlemen:

Reference is made to the provisions of the agreement between your organization and the Department of Water Resources, dated April 1, 1957, providing for an economic survey of the Antelope-Mojave area. The agreement contains the following provisions:

"Said survey is to include: A description of the area's present economic characteristics, under assumption of ample water supplies for the area at assumed delivery cost for water to be specified by the Department of Water Resources, and evaluation of the area's potential development, including agriculture, military, commercial, and industrial." (Emphasis supplied).

Pursuant to the foregoing, it is the purpose of this letter to provide your organization with the price assumptions for imported water you are to employ in the Antelope-Mojave area. As indicated to you at the time of negotiation of the foregoing agreement, the prices for water delivery quoted hereinafter were developed specifically for your use in making your study and are intended to be used only to determine the effect of price of imported water upon the probable magnitude of utilization of such water in the area of investigation. It is hoped to cover generally the entire range of prices, which may possibly be assigned for the delivery of imported water in the area of investigation in the future. As you undoubtedly know, the actual price for delivery of imported water in this and other potential service areas of the Feather River Project is a policy matter upon which no decision has as yet been made.

Bearing in mind the foregoing considerations, the Department of Water Resources requests that your organization in its economic survey of the Antelope-Mojave area assume the following upper and lower values of prices for imported water in the area of investigation:

Agricultural water delivered at
farmer's head gate:

\$25 per acre-foot and \$50 per acre-foot

Municipal and industrial water delivered
to municipal system:

\$50 per acre-foot and \$100 per acre-foot

Your representatives have indicated to us that in order to carry out the economic survey of the Antelope-Mojave area, it is necessary that this Department provide them with a date when Feather River Project water may be expected to be made available in the area. For the purposes of your study it is requested that you assume the year 1970 as the date when such water will be made available to the investigational areas. You, of course, will realize that this date is purely for study purposes. The determination of the delivery date for Feather River Project water in the area can be made only after detailed analysis of the timing and need for imported water throughout the remainder of the potential project service area, together with completion of other phases of the alternative Feather River Project route studies now under way. In view of the recognized uncertainty as to timing of availability of imported water in the area, you may wish to evaluate in your study the effect on economic development therein which would result with changes in the foregoing assumed date.

It is hoped that the foregoing information will be adequate for your purposes and should your staff have any further questions, we will be happy to discuss them with you at any time.

Very truly yours,

HARVEY O. BANKS
Director of Water Resources

By _____
Max Bookman
District Engineer

APPENDIX B

APPENDIX BPERSONS INTERVIEWED OR CONSULTED
(In Alphabetical Order)

Tracey Abell
Los Angeles City Planning Department
Los Angeles, California

Robert Aikins, Manager and Director
Antelope Valley Feather River Project Association
Palmdale, California

Ned Arthur
Mineral Section
Los Angeles Chamber of Commerce
Los Angeles, California

Roy Barnes
Farm Advisor, Kern County
University of California Agricultural Extension Service
Bakersfield, California

Newton Bass
Real Estate
Apple Valley, California

Edwin Bates, Manager, Regional Office
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Los Angeles, California

Frank Baxter, Assistant Division Sales Manager
Permanente Cement Company
Los Angeles, California

Gordon Bennett, Special Assistant on Aviation
White House
Washington, D. C.

Harry Bergh, Director
Orange County Planning Department
Santa Ana, California

Lieutenant Colonel S. L. Berry
Chief of Facilities Branch for Deputy Chief of Staff
for Development
United States Air Force
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Farm Advisor, Los Angeles County
University of California Agricultural Extension Service
Los Angeles, California

Marion Blair, Administrator
Civil Engineer Planning Division
Los Angeles County Road Department
Los Angeles California

Robert Bloesser, Assistant Director
Industrial Division
Los Angeles Chamber of Commerce
Los Angeles, California

L. J. Borstelmann, Director
Ventura County Planning Commission
Ventura, California

Forrest Branch, Vice President, Administrative Service
American Potash and Chemical Corporation
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Milton Breivogel, Director of Planning
Regional Planning Commission
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Los Angeles, California

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for Property and Installations - Navy
Washington, D. C.

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R. H. Osbrink Manufacturing Company
Los Angeles, California

Dan E. Bundy, Senior Planning Engineer
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Los Angeles, California

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Office of Assistant Secretary of Defense
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Mettler-Bury Ranch
Antelope Valley, California

Gerald Busch, Head, Economics Section
Lockheed Aircraft Corporation
Burbank, California .

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Ventura County Chamber of Commerce
Ventura, California

Captain Carruthers
Public Works Officer
Naval Ordnance Test Station
China Lake, California

Whitford B. Carter
Lancaster, California

George M. Cary, District Airport Engineer
United States Department of Commerce
Civil Aeronautics Administration
Los Angeles, California

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Naval Ordnance Test Station
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Barstow, California

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Randsburg, California

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San Bernardino, California

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Littlerock, California

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Marine Corps Auxiliary Air Station
Mojave, California

Lewis E. De Voss
Field Representative
Department of Employment

Brigadier General R. B. DeWitt
Commanding Officer
Marine Corps Supply Center
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Consulting Engineer
Redlands, California

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San Bernardino County Agricultural Commission Office
Victorville, California

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San Bernardino County
University of California Agricultural Extension Service
San Bernardino, California

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Cecil Dunn, Manager, Rate Department
Southern Counties Gas Company
Los Angeles, California

Chester Dye
Los Angeles Department of Water and Power
Los Angeles, California

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University of California at Los Angeles
Los Angeles, California

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Southern Pacific Company
Los Angeles, California

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San Bernardino County Board of Trade
San Bernardino, California

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Palmdale Irrigation District
Palmdale, California

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Special Assistant to the Secretary of the Air Force
Washington, D. C.

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Extension Soils Specialist
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Riverside, California

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Ridgecrest, California

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Office of Assessor, Los Angeles County
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State Department of Finance
Sacramento, California

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Atchison, Topeka & Santa Fe Railway
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Pacific Coast Borax Division
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Director of Personnel
George Air Force Base

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Lancaster, California

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State Department of Employment Office
Lancaster, California

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Victorville, California

Clarence Harling, District Manager
California Interstate Telephone Company
Victorville, California

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Military Assistant on Construction to Controller
Department of Defense
Washington, D. C.

Dr. Phillip M. Hauser
Chairman, Department of Sociology
University of Chicago
Chicago, Illinois

William Hendrie, Manager
Barstow Chamber of Commerce
Barstow, California

Rex L. Henry
Farm Advisor, Los Angeles County
University of California Agricultural Extension Service
Los Angeles, California

Joseph P. Hertel
Farm Advisor, San Bernardino County
University of California Agricultural Extension Service

R. A. Hertzler
Office of Undersecretary for Civil Affairs
United States Army
Washington, D. C.

Dr. Robert Hilburn
Superintendent of Schools
Barstow, California

Andrew Hinshaw
Division of Research and Statistics
State Board of Equalization
Los Angeles, California

Lawrence Hoelscher, Deputy Comptroller
Department of the Army
Washington, D. C.

Walter Hoffman, Hydraulic Engineer
United States Department of the Interior
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Los Angeles, California

Edward Holden, Division Head
North County Zoning Division
Regional Planning Commission, Los Angeles County
Los Angeles, California

Jay Homan, Planning Technician
Planning Commission, County of San Bernardino
San Bernardino, California

John Hoyt
Farm Advisor, Kern County
University of California Agricultural Extension Service

William Huffman
Farm Advisor, Los Angeles County
University of California Agricultural Extension Service

George Hummel, Realtor
Rosamond, California

Lieutenant Colonel O. J. Iddins
Acting Chief of Staff for Installations
Edwards Air Force Base
Edwards, California

Conrad Jameson, Vice President
Security-First National Bank
Los Angeles, California

Ray Janson, Regional Planner
Regional Planning Commission, Los Angeles County
Lancaster, California

Joseph Jensen, Chairman
Metropolitan Water District
Los Angeles, California

Charles Johnson
Quartz Hill, California

W. H. Johnson, Manager of Properties
Union Pacific Railroad Company
Los Angeles, California

Frank Jones
Investment Securities and Real Estate
Los Angeles, California

Roger Jones, Assistant Director
United States Bureau of the Budget
Washington, D. C.

Mr. Kane
District Highway Engineer
District VIII
San Bernardino, California

Ray Kerby
Design Division
Los Angeles Department of Water and Power
Los Angeles, California

Robert W. King
Public Relations Department
Southern Pacific Railroad
Los Angeles, California

James Koteas, Personnel Manager
South Gate Magnesium and Aluminum Company
South Gate, California

L. B. Krauter
Kern County Agricultural Commissioner's Office
Tehachapi, California

James B. Laing, Jr.
Reports and Analysis Section
Bank of America
Los Angeles, California

Lieutenant Colonel H. L. Lantz
Executive Officer
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District Manager, Southwest Gas Company
Barstow, California

George J. Ziser, District Manager
California Department of Veterans' Affairs
San Bernardino, California

STATE OF CALIFORNIA
STANDARD AGREEMENT

CONTRACTOR ()

STATE AGENCY—()

DEPT. OF FINANCE—()

CONTROLLER—()

NUMBER 57-SA-109

THIS AGREEMENT, Made and entered into this 1st day of April, 1957, at Sacramento, County of Sacramento, State of California, by and between State of California, through its duly elected or appointed, qualified and acting

Chief, Division of Administration Department of Water Resources
Title of officer acting for State Department or other agency
hereinafter called the State, and

Booz - Allen & Hamilton
hereinafter called the Contractor.

WITNESSETH: That the Contractor for and in consideration of the covenants, conditions, agreements, and stipulations of the State hereinafter expressed, does hereby agree to furnish to the State services and materials, as follows:

(Set forth service to be rendered by Contractor, amount to be paid Contractor, time for performance or completion, and attach plans and specifications, if any.)

1. Contractor is to conduct an economic survey for the Department of Water Resources covering that portion of the Antelope Valley and Mojave River Area, in Los Angeles, San Bernardino, and Kern Counties which lies within the economically practicable service area of the Feather River Project. Said survey report is to include: a description of the area's present economic characteristics; under assumptions of ample water supplies for the area at assumed delivery cost for water to be specified by the Department of Water Resources, an evaluation of the area's potential development, including agricultural, military, commercial, and industrial; estimates of payment capacity for water by major uses; and a quantitative estimate of population growth by decades for the period 1960 through 2020, together with an estimate of the character and type of probable land use by decades for the same period of time, with the end objective that all of the foregoing information be analyzed and submitted in such a manner that the Department of Water Resources can use said information as a basis for estimating water requirements by major use categories for said area and covering the same period of time. The Department of Water Resources will furnish its estimates of water requirements based on the survey information to the Contractor for inclusion in the Contractor's final report. The conducting of this investigation by the Contractor shall include periodic progress discussions with the Department at approximately one month intervals. The Contractor shall also confer with those major interests that would be affected by the availability or lack of availability of adequate water supplies for the area, with the objective of providing reasonable opportunity for expressions of viewpoint by said major interests during the course of the survey.
2. The services performed by the Contractor pursuant to this agreement shall be completed and reported upon in accordance with the following schedule:

- a. by September 16, 1957, a preliminary report, together with two copies thereof, covering the matters specified in Section 1, above, will be submitted to the Department of Water Resources.
 - b. By December 2, 1957, the final report, together with five copies thereof and the multilith plates, will be submitted to the Department of Water Resources. The final report shall contain substantially the same information as submitted in the preliminary report plus the translation of the original data into water requirements.
 - c. At the completion of the contract, the Contractor shall furnish to the Department one copy each of all important work sheets and basic data used in preparation of the report.
3. The amount of this agreement is \$45,000, payable to the Contractor as follows: Four progress payments not exceeding \$40,000 in total, with the remaining balance withheld until completion of this agreement covering the work performed in a manner satisfactory to the State provided that accumulated payments shall not be in excess of accumulated charges by the Contractor at any time. The Contractor shall furnish an invoice in triplicate as of each of the progress payment dates including a certification that its accumulated charges to the date of the invoice are equal to or in excess of the amounts billed on that date, and with each of the first three invoices the Contractor shall furnish a progress report of work performed during the invoice period.
 4. This agreement shall terminate on December 15, 1957.

IN WITNESS WHEREOF, This agreement has been executed, in quadruplicate, by and on behalf of the parties hereto the day and year first above written.

STATE OF CALIFORNIA

Department of Water Resources
Name of State agency

Contractor Booz - Allen & Hamilton
(If other than an individual, state whether a corporation, partnership, etc.)

By _____

By _____
R. James Murphy
Chief, Division of Administration
Title

120 Montgomery Street
San Francisco 4, California
Address

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